

External opinions on SSbD by different Stakeholders

Moderated by Beatriz Alfaro Serrano, BNN, Austria

Experts on SSbD



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Ms Blanca Suarez



Mr Sean Kelly

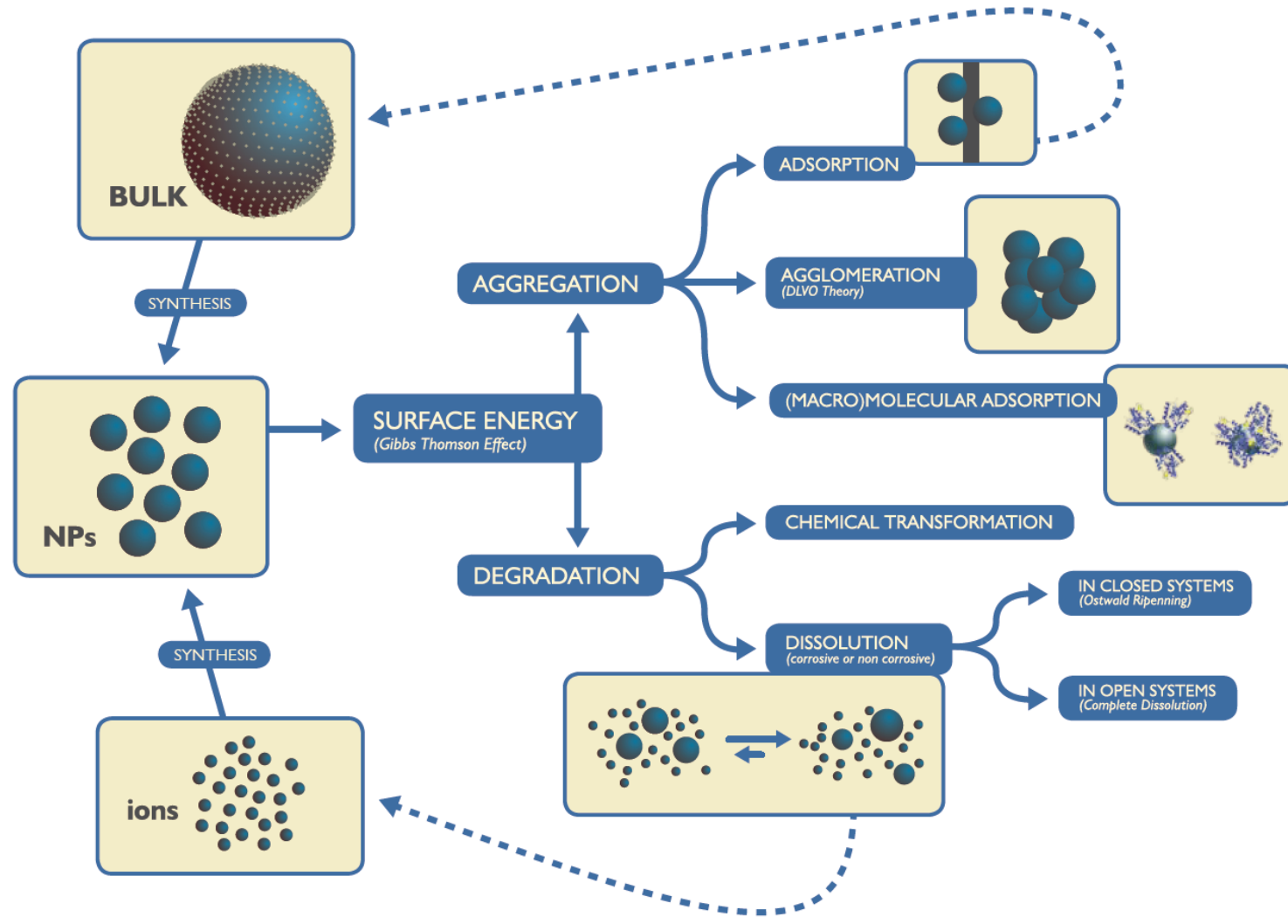
Representing **Academia** (ICREA):

Victor Puntes

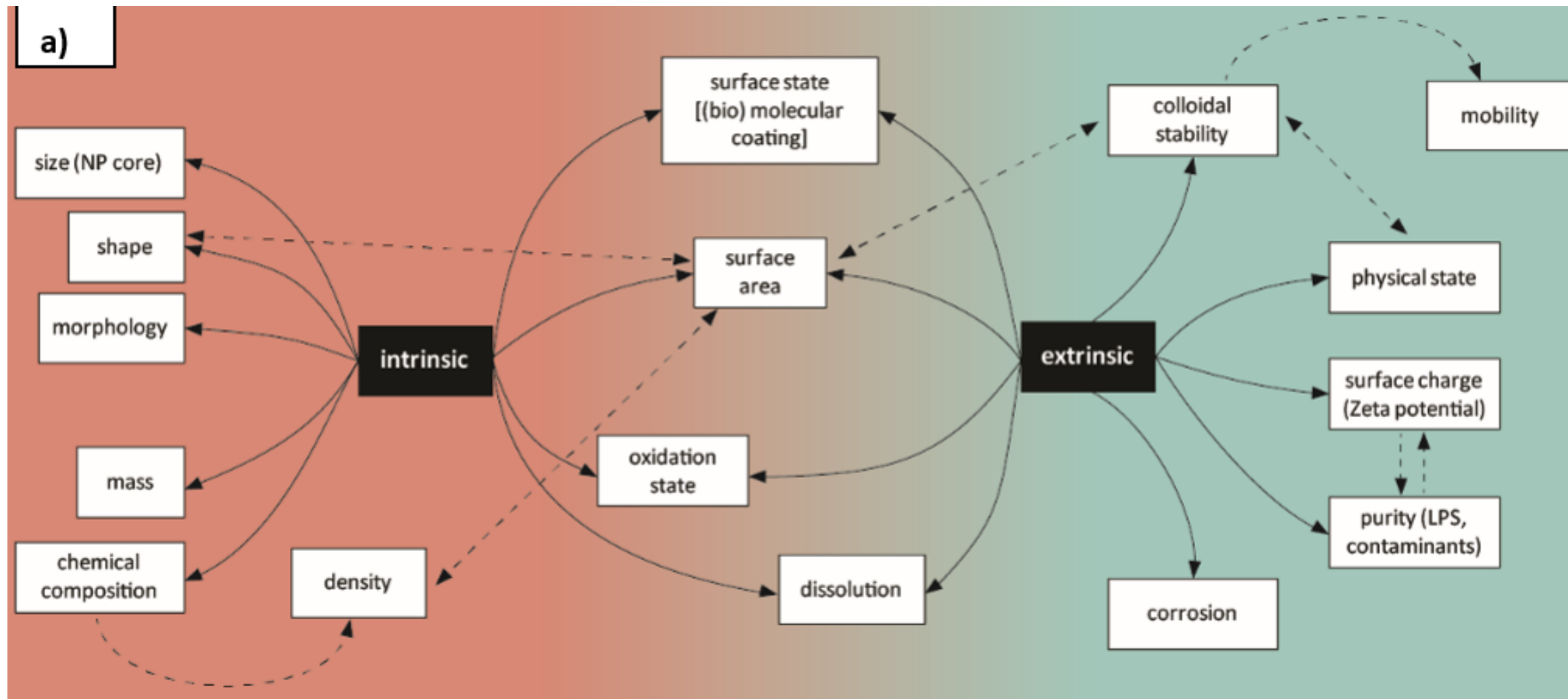
Research Professor at ICREA



Associated Causes to Nanoparticles Induced Toxicity

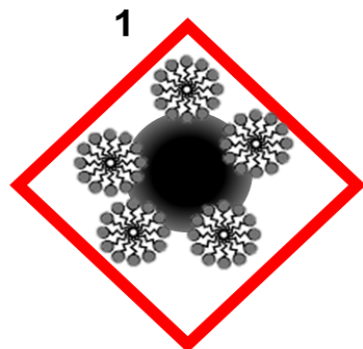


Associated Causes to Nanoparticles Induced Toxicity

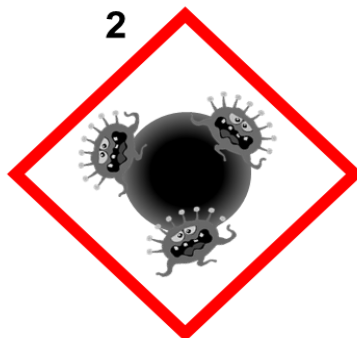


Associated Causes to Nanoparticles Induced Toxicity

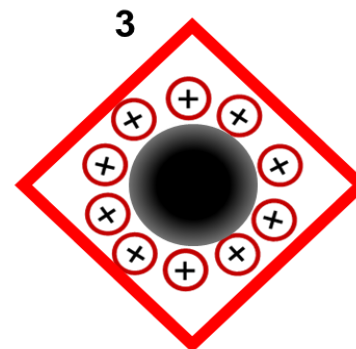
1. Presence of toxic moieties.



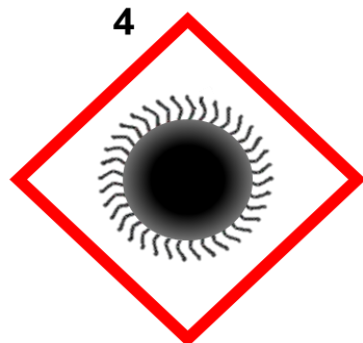
2. By-standers and pollutants.



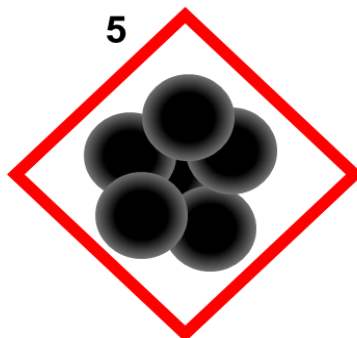
3. Cationic charges.



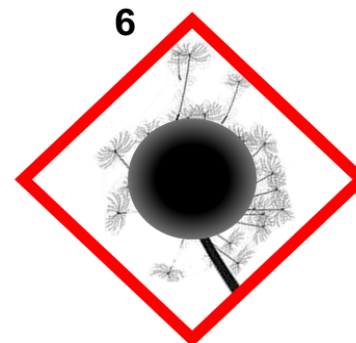
4. Hydrophobicity.



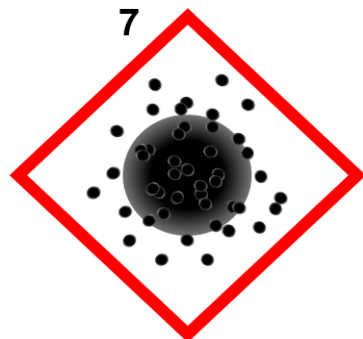
5. Aggregation and frustrated phagocytosis.



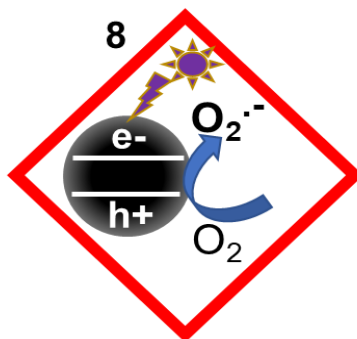
6. Antigens or allergens.



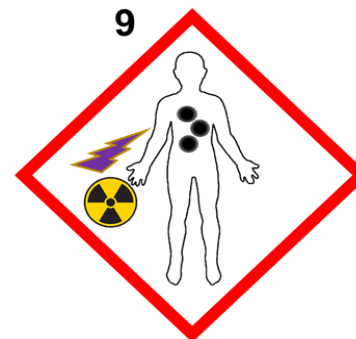
7. Corrosion and chemical transformations.



8. (Photo)catalysis.



9. Irradiation absorption.



Representing **Academia** (University of Vigo, Spain) :



**Mario
Pansera**

Responsible Research &
Innovation

Representing **Academia** (University of Birmingham):

Eva Valsami-Jones

Professor of Environmental
Nanoscience





UNIVERSITY OF
BIRMINGHAM

A perspective of Safe & Sustainable by Design

Éva Valsami-Jones

Professor of Environmental Nanoscience

Key criteria

Safe

- Risk of harm from materials, chemicals and their products is minimised
- Hazard understood

Sustainable

- Resources are used ethically
- Operations respect society and the environment



Who can deliver this?



The NSC is an EC initiative, with the following main roles:

- represent the scientific community - eg synergies amongst projects
- provide technical support to the Commission / develop strategies
- enable public confidence in nanosafety



Further reading/thinking

Nano Today 42 (2022) 101364

Contents lists available at ScienceDirect

Nano Today

journal homepage: www.elsevier.com/locate/nanotoday

Opinion

From small to clever: What does the future hold for the safety and sustainability of advanced materials?

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^d BioNanoNet Forschungsgesellschaft mbH, Graz, Austria



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ABSTRACT

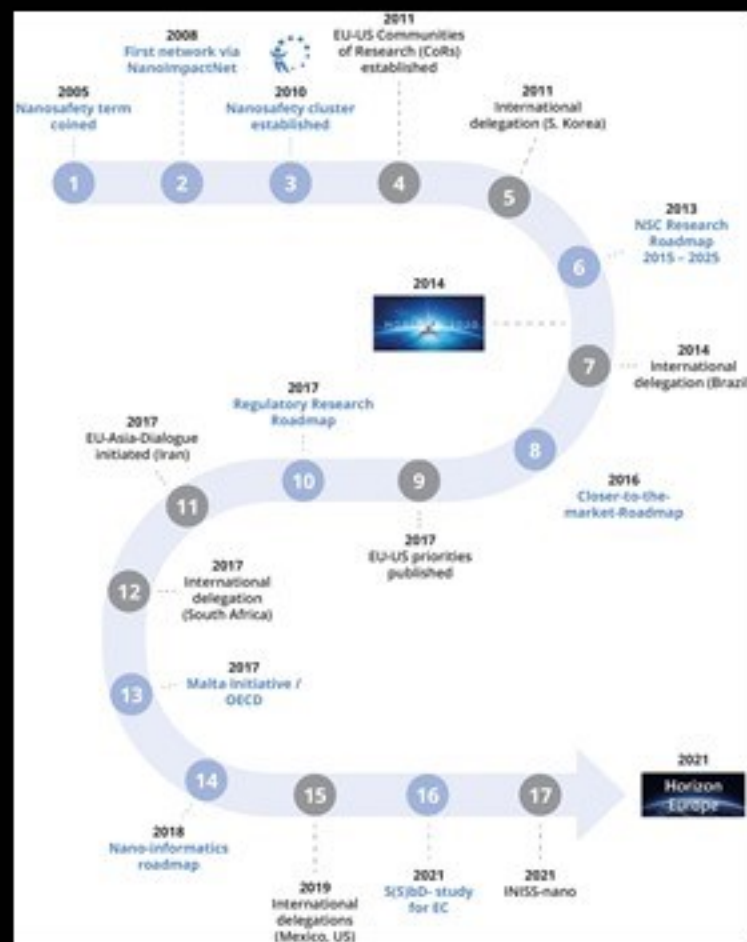
The world expects solutions to a multitude of technological challenges, from curing disease to mitigating climate change, from increasingly more “clever” or “advanced” materials. But how do we address the safety of ever more novel substances and what have we learned from the last 15 years of nanosafety research? In this opinion letter, we¹ share our views on how to develop a framework for these new families of materials, that capitalizes on the nanosafety progress achieved to date, and how to ensure the wider nanoscience community could play a part in this new challenge.

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Further reading/thinking



Past success key to the future?

- Precedence
- Confidence in process
- Numerous breakthroughs
- Interdisciplinarity
- Internationalization



Representative of starting **PARC** project:

Denis Sarigiannis

Chemical engineer, exposome,
industrial ecology, risk assessment



Safe and Sustainable-by-Design in the PARC project

D.A. Sarigiannis^{1,2,3}

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Piazza della Vittoria 15, Pavia 27100, Italy

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Dimensions of safety and sustainability in the SSbD criteria definition

- The cornerstone of Safe-by-Design criteria should be the coordinated effort to safeguard human health followed by environmental hazards. However, we need to ensure:
 - Aiming at these goals is not against major sustainability goals (such as minimizing GHG emissions, environmental pollution and maximizing efficiency in resource use)
- Sustainable-by-Design criteria should foster Circularity, a key feature of the Green Deal
- SSbD principles need to be respected during the overall lifetime of products/ materials/chemicals (accounting for their whole life cycle)
 - Particular attention has to be paid to the holistic design of systems, and the adoption of a life cycle thinking
 - Avoid design practices that cause burden shifting to other domains, e.g. from one thematic area to another (e.g. health to climate change and vice versa), or between media (e.g. from water to sludge)



Implementation of SSbD criteria

- The 7 years duration of the project allows the room for a step-wise process implementation of the criteria
- A recommendation/guideline document should be a starting point, delivered within the first 3 years of the project
- For the next years, we should focus on the development of a certification scheme for SSbD chemicals, materials and products. WP8 will be able to technically support the compliance to the certification scheme as follow:
 - The **SSbD assessment toolbox** in support of the application of evaluation criteria, aiming directly at the successful implementation of the certification scheme
 - This toolbox will be used to describe methods with which critical properties of chemicals, products, materials, packaging and application processes can be identified from early stage of innovation
- Development at the international level (in particular within OECD) will be followed



EC concept and planning – synergies with ongoing activities

- Chemicals Strategy for Sustainability Towards a Toxic-Free Environment
- European Platform on Life Cycle Assessment
- OECD Guidance on key considerations for the identification and selection of safer chemical alternatives
- European Technology Platform for Sustainable Chemistry
 - ✓ Although all these initiatives aim at the development of criteria and increasing of awareness among the involved parties, PARC in WP8 will develop a **SSbD assessment toolbox** that will substantiate the application of the SSbD criteria
- Low-hanging fruit:
 - ✓ Strong focus on lessons learned from SbD and Sus-b-D projects, e.g. on nanomaterials
 - ✓ Check the effectiveness and transferability of the methodology and toolbox developed in PARC on nanomaterials

Bertold Brecht's *Life of Galileo*:

"The main objective of science is not to open the door to infinite wisdom but to roll back the boundaries of infinite error".

Thank you for your attention



www.enve-lab.eu

A connectivity perspective to environmental health

Representing the **European Commission**:



**Jana
Drbohlavova**

Seconded National Expert
in the European Commission



The way towards SSbD chemicals and materials

SABYDOMA SSbD workshop, 18.2.2022

Jana Drbohlavova, DG RTD

Safe&Sustainable by design...

- Holistic approach taking into account **many different aspects**
- **Chemicals and materials** are building blocks ...
- ...“don’t let hazardous chemicals enter to your **products**”
- long-term SS, considering the whole life cycle



What tools are needed to achieve it?

- SSbD is very complex: processing, safety, environmental impacts, recycling, requested functionality, etc.
- Advanced physico-chemical **characterization**
- Advanced **modelling and simulation**:
 - Multi-modal, multi-scale, multi-dimensional, multi-objective
 - Predictive, robust, interoperable and adaptive
 - Artificial intelligence based in silico models of the environmental behavior (kinetics and toxicodynamics, fate and transformation/degradability) of **chemicals and mixtures**
 - Valorising circularity: models to redesign materials made from **secondary raw materials**

What else?

- Integration of **social, economic and environmental aspects of LCA**
- Integration of **risk and life cycle assessment**
- Sustainable production, consumption and end of life stages
- Develop **impact indicators** to monitor the drivers of chemical pollution through the life cycle of a substance
- Develop **SSbD toolbox** with access to FAIR data from across the value chain
 - Harmonised approach: methods, models and indicators
 - Accessible to all stakeholders, in particular to SMEs to help them foster innovation
 - Facilitate the integration of future legal requirements for market compliance

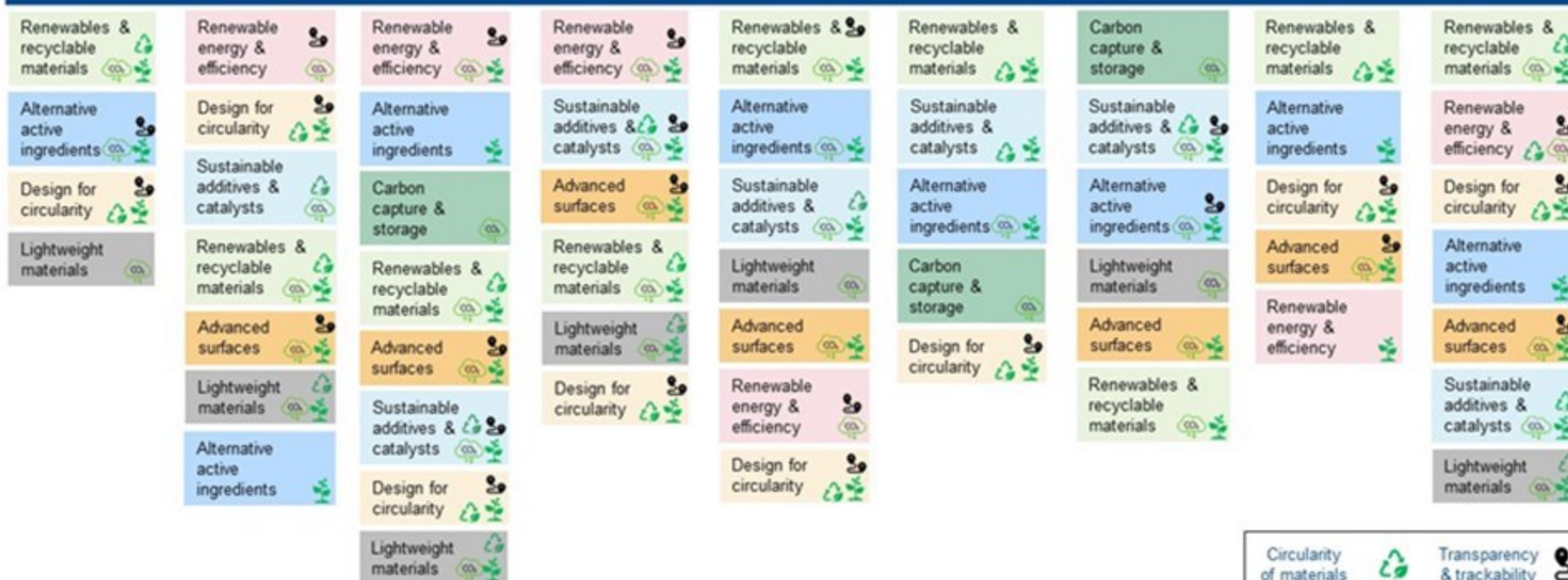


Materials 2030 Manifesto



New Technology & Innovation: resources and processes optimization (energy, production, performance increase), materials data, digital twins & passports, big database, AI, blockchain, mass customization, sensing, new biotechnology methods

New Policies: Harmonized norms & standards, certification schemes, Eco-label compliance on all products levels, insure sovereignty & EU autonomy, lifecycle assessment



https://ec.europa.eu/info/sites/default/files/research_and_innovation/research_by_area/documents/advanced-materials-2030-manifesto.pdf



European
Commission

Thank you



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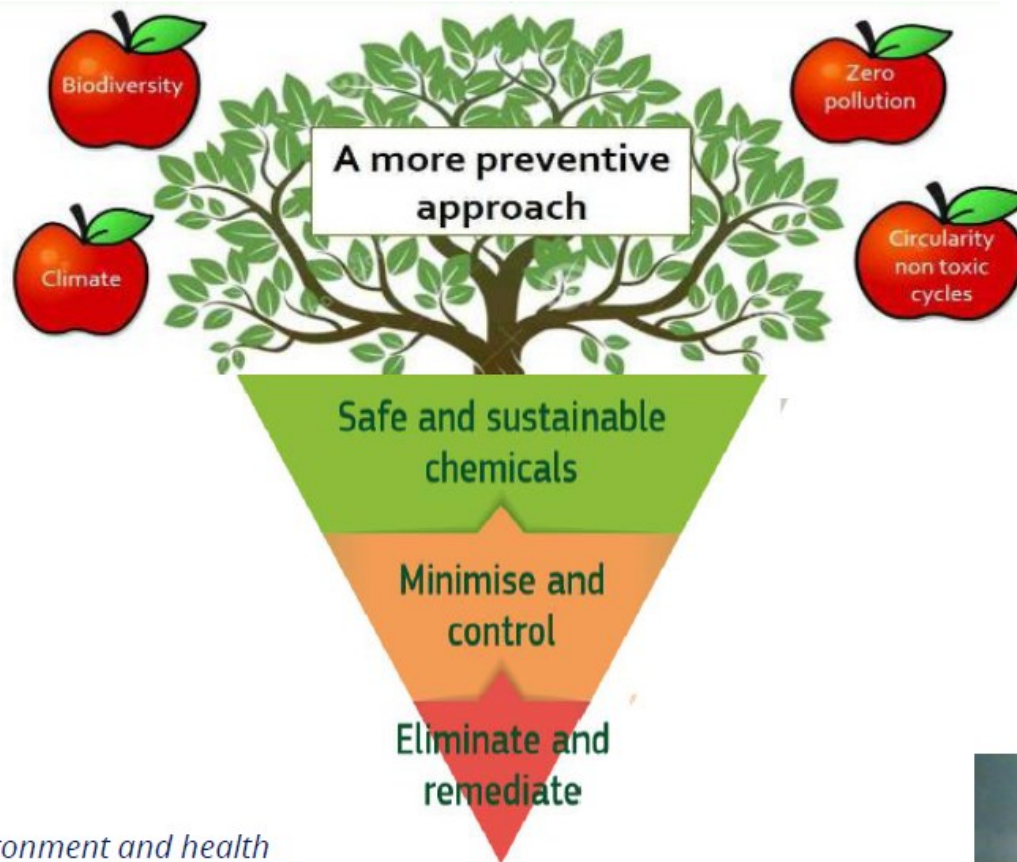
Representing the **European Environmental Agency (EEA)**:



**Xenia
Trier**

Expert on Chemicals, Environment and Human Health

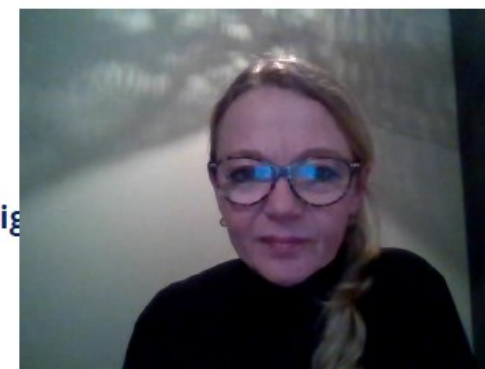
EEA vision for **Safe and Sustainable by design**



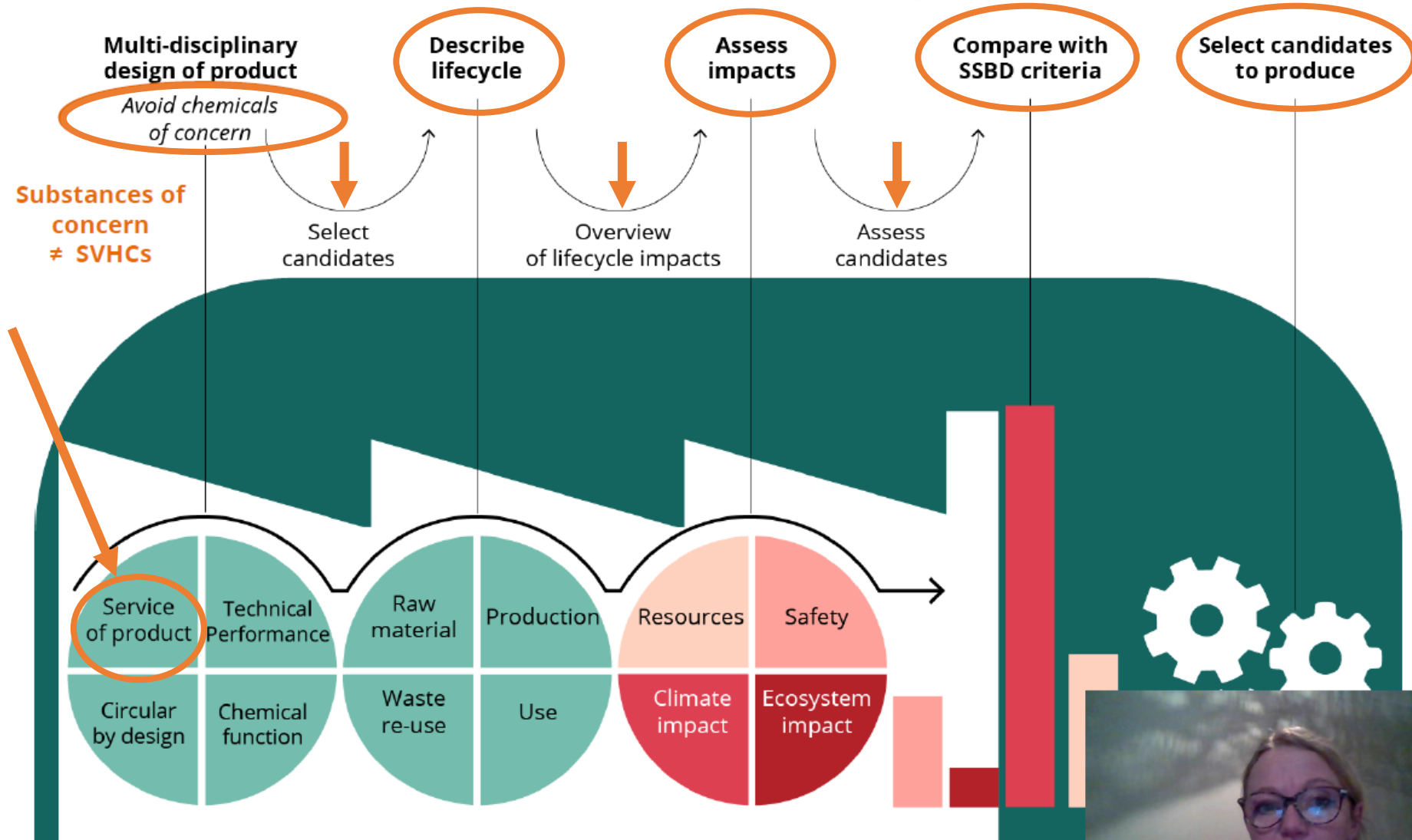
Xenia Trier, Ph.D.

*Expert on chemicals, environment and health
European Environment Agency*

SABYDOMA workshop - A Stakeholder's Perspective of Safe-and Sustainable-by-Design
February 18th 2022



Safe and Sustainable by Design - *applied by industry*



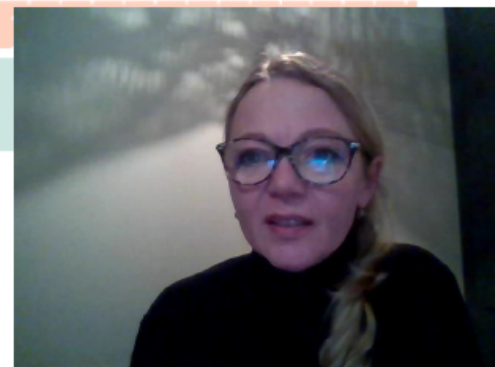
Assessing Safe and Sustainable by Design

- compare with SSBD criteria

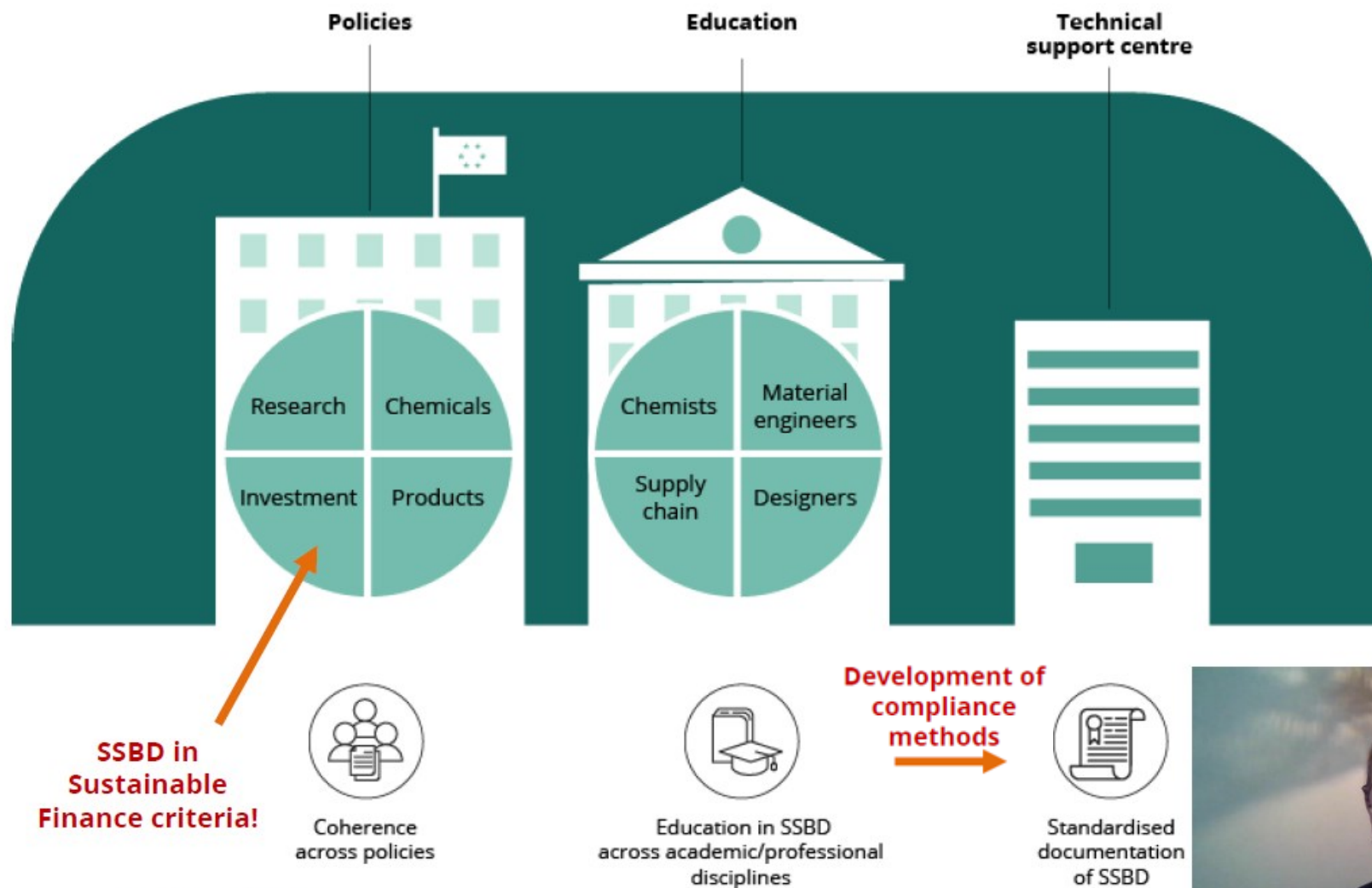
- **Meet sustainability goals** - without compromising **safety**!
- **Avoid burden shifting and create trust in SSBD** by setting minimum scores
- **Criteria for minimum and total scores informed by protection goals of society**



EEA webbriefing on Safe and Sustainable by Design, 2021:
<https://www.eea.europa.eu/themes/human/chemicals/delivering-products-that-are-safe>



Safe and Sustainable by Design – enabling environment



**SSBD in
Sustainable
Finance criteria!**



Coherence
across policies



Education in SSBD
across academic/professional
disciplines

**Development of
compliance
methods**



Standardised
documentation
of SSBD

Source: EEA 2021,
[Preventing chemical pollution requires a new approach for designing safe and sustainable prod](#)



Thanks for listening!

Xenia Trier, Ph.D.

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**European
Environment
Agency**



Read our Report [Europe's environment – State](#)



Representing the **European Chemical Industry Council (CEFIC):**



**Anne Chloe
Devic**

Senior Innovation Manager in
the European Chemical Industry
Council (Cefic)



Safe and Sustainable- by-design

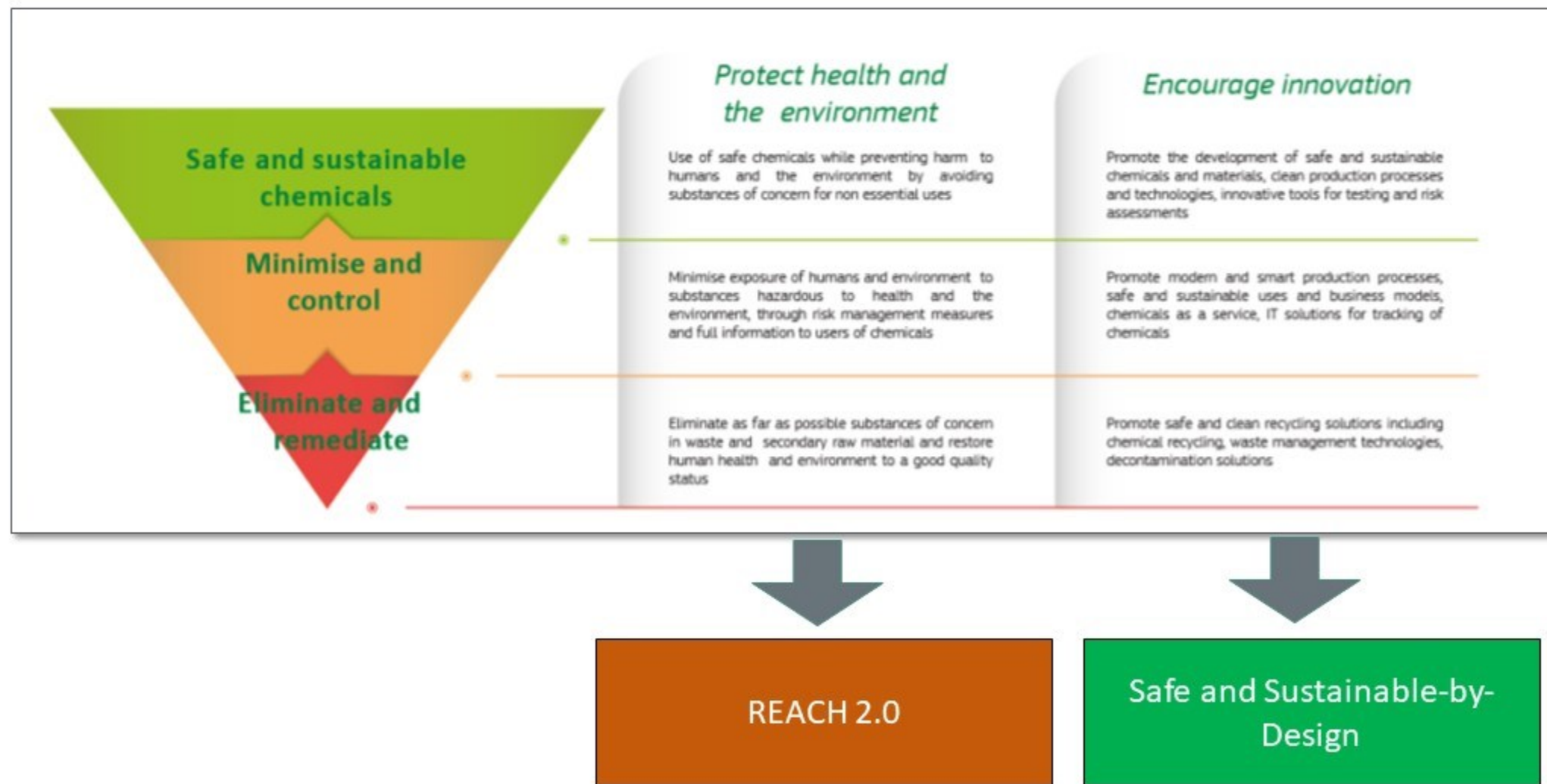
18th of February 2022

Anne Chloé Devic



The Vision – Towards a toxic-free environment

Interplay of regulatory measures and innovation support



How do we define Safe and Sustainable-by-Design?



Safe and Sustainable-by-Design is a process to innovate and put on the market chemicals, materials, products and technologies that are:

- safe, and
- deliver environmental, societal, and/or economical value through their applications.

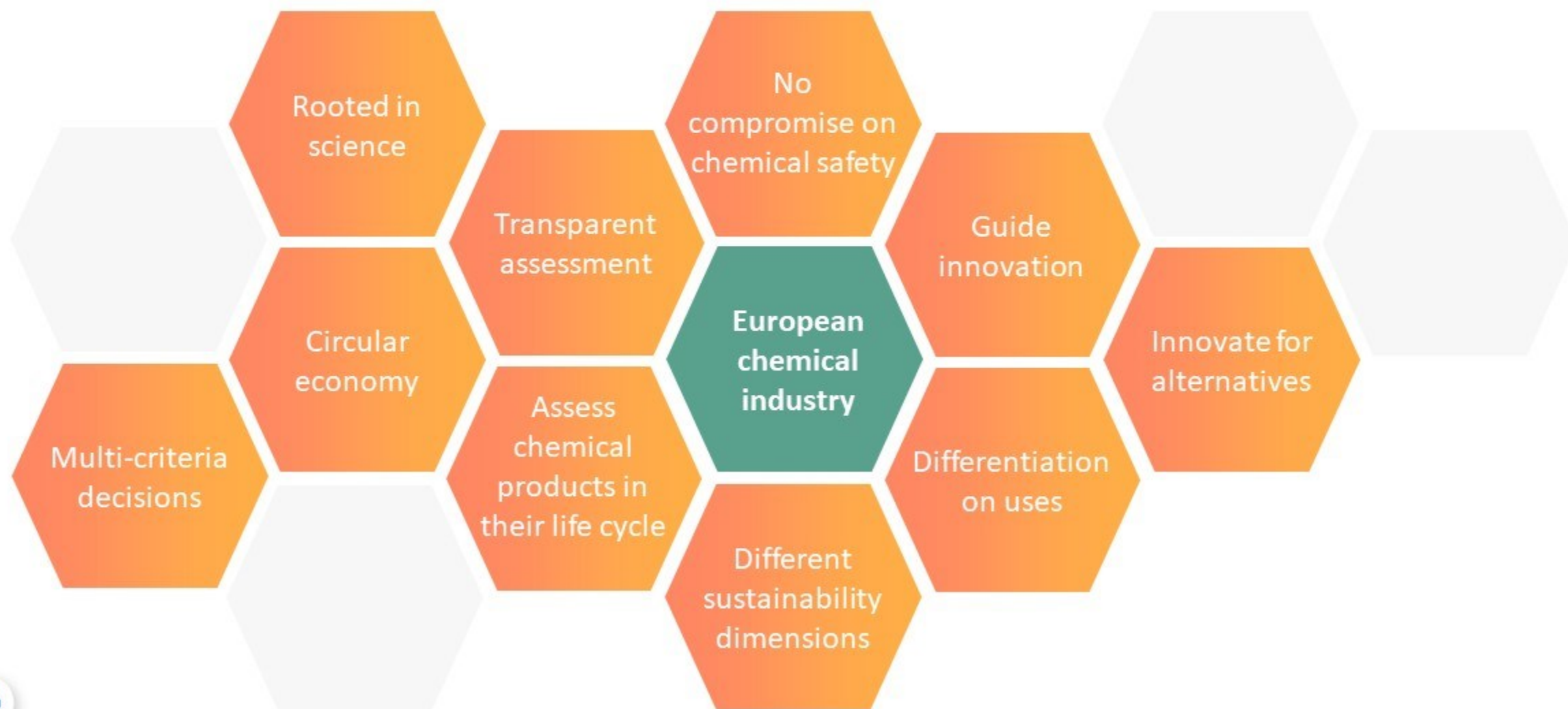
ENABLE:



- Accelerating the transition towards a circular economy and climate-neutral society
- Preventing harm to human health and the environment throughout the life cycle



Principles taking the concept forward



Safe and sustainable by design: process to bring **products & technologies** to the market that are safe, bring environmental, economic and social value **through their applications**, are **accelerating the transition** towards a circular economy and climate-neutral society and **preventing harm** to human health and the environment.



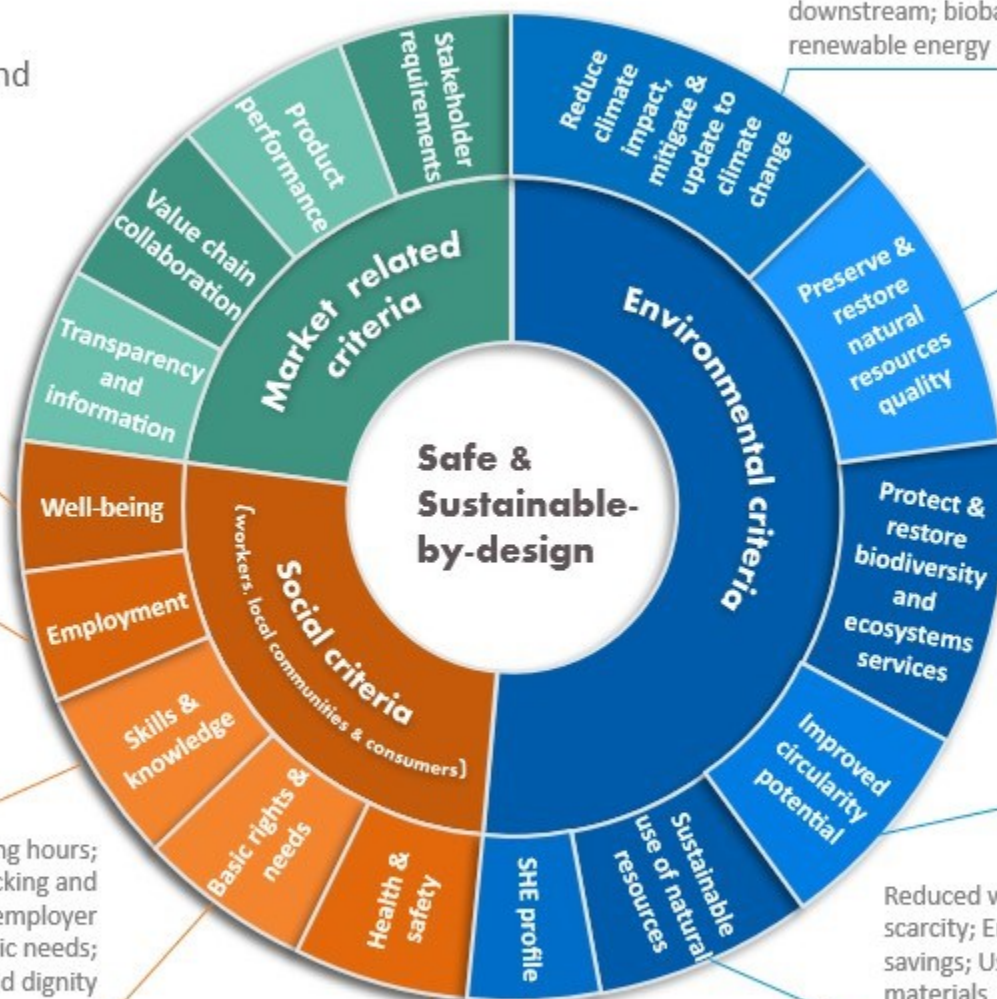
Job satisfaction; work-life balance; access to tangible resources; nuisance reduction; community engagement; responsible communication; consumer's product experience

Management of reorganization; job creation

Skills, knowledge and employability; promotion of skills and knowledge for local community and consumers

Fair wages; appropriate working hours; no forced labor, human trafficking and slavery; no discrimination; social/employer security and benefits; access to basic needs; respect for human rights and dignity

Occupational health risks; H&S of local community's living conditions; safety management at work; management of workers' individual health; product safety; impact on consumer health



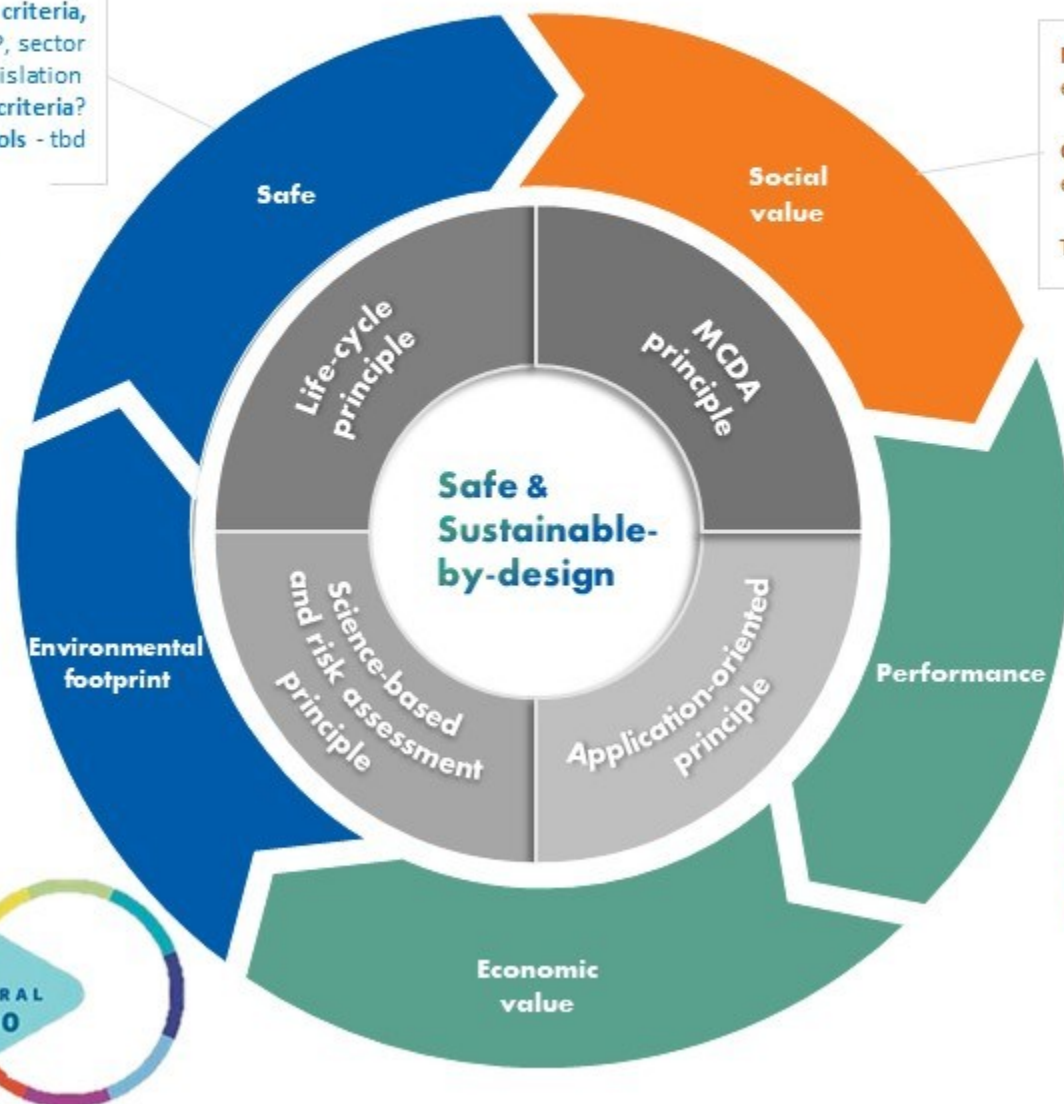
Our input towards an assessment framework

Safe and sustainable by design: process to bring **products & technologies** to the market that are safe, bring environmental, economic and social value **through their applications**, are **accelerating the transition** towards a circular economy and climate-neutral society and **preventing harm** to human health and the environment.



Minimum criteria,
e.g., REACH, CLP, sector
legislation
Other criteria?
New Tools - tbd

Minimum criteria,
e.g., compliance with OSH, ILO, ...
Other criteria,
e.g., nutrition goals, ...
Tools - tbd



Examples of innovation principles – goals - considerations

How could this look like? Example taken from ongoing OECD work on plastics

- Examples of design principles
 - Maximise resource efficiency
 - Eliminate and minimise hazards and pollution
 - Design systems holistically and using life cycle thinking
- Examples of design goals
 - Select materials that generate no waste
 - Select materials that use secondary feedstock or biobased feedstock
 - ...
- Examples of Considerations during the manufacturing phase
 - Select a manufacturing technique that generates the least emission, uses the least processing aids, uses non-hazardous or the least hazardous chemicals or minimises worker exposure





Thank you



Representing ChemSec (International Chemical Secretariat):

**Henrik
Edin**

Policy Advisor, working with
chemicals & circular economy





SAFE AND SUSTAINABLE BY DESIGN

How to set up Safe and Sustainable by Design to drive substitution

CHEMSEC POSITION

- Safe should always mean safe
- Safe and sustainable by design criteria should drive substitution
- Implement it now, and do it stepwise



SAFE SHOULD MEAN SAFE

Substances of concern should never be labelled safe

- It would not improve the protection of human health and the environment
- It would compromise trust in the market and in decisionmakers
- It would create implications on the circular economy, with billions of euros lost in failed recycling

DRIVER FOR SUBSTITUTION

- Should not be a minimum requirement
- Should be something that companies strives towards
- A labelling system would enable finances to drive substitution





IMPLEMENT IT NOW

- There is already plenty of data that can be used to assess the climate impact of production
- Should be possible to implement at least one parameter very swiftly
- Having a clear timetable for implementing other parameters over time

Representing **Consultancy**:

**Blanca
Suarez**

EU project manager with
a focus on SbD



Safe and Sustainable by Design

A view from a consultant company

Véronique Adam, Beatrice Salieri, Blanca Suarez-Merino

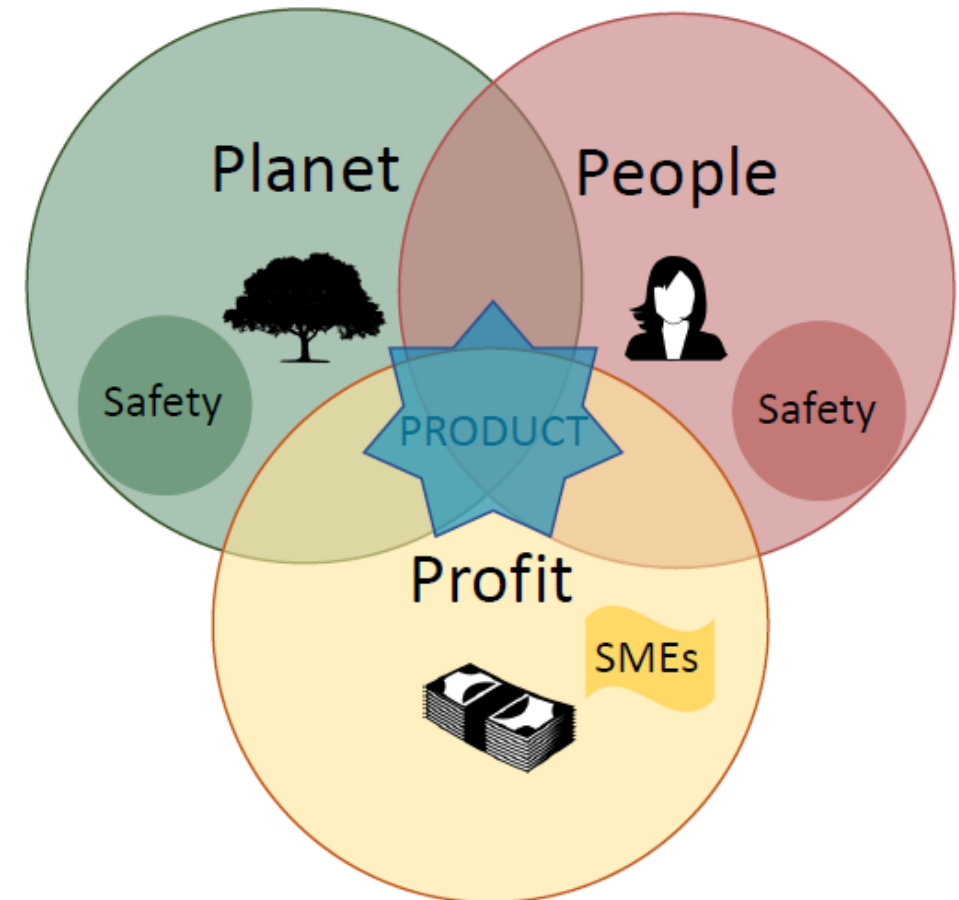
Safe-and-Sustainable-by-Design

Safety inherent to sustainability

Suitable for SMEs

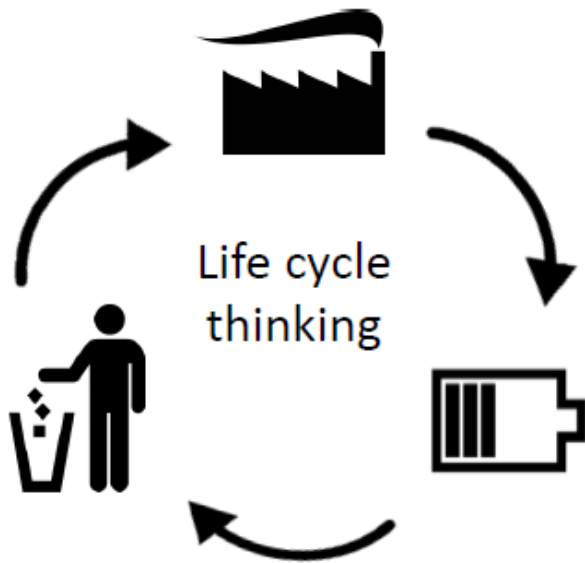
- Tools available and usable with limited resources

Assessment at product level



Safe-and-Sustainable-by-Design within Harmless

General aim: To support companies in developing safe and sustainable multi-component nanomaterials and nano-enabled products



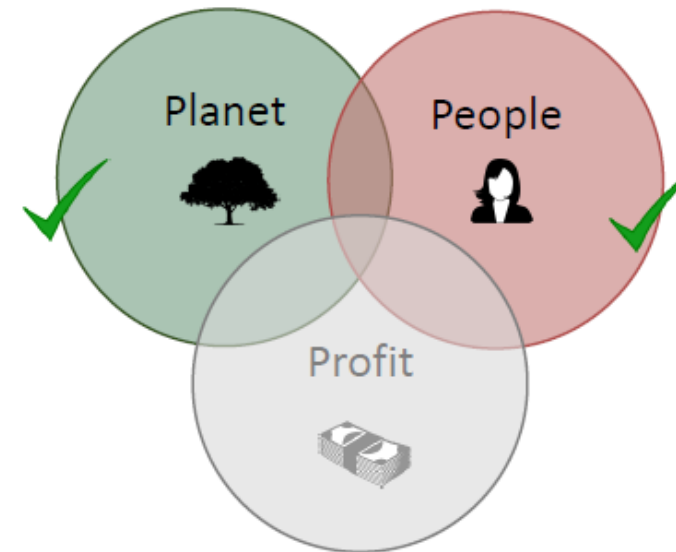
- LCA tools
- Circularity assessment



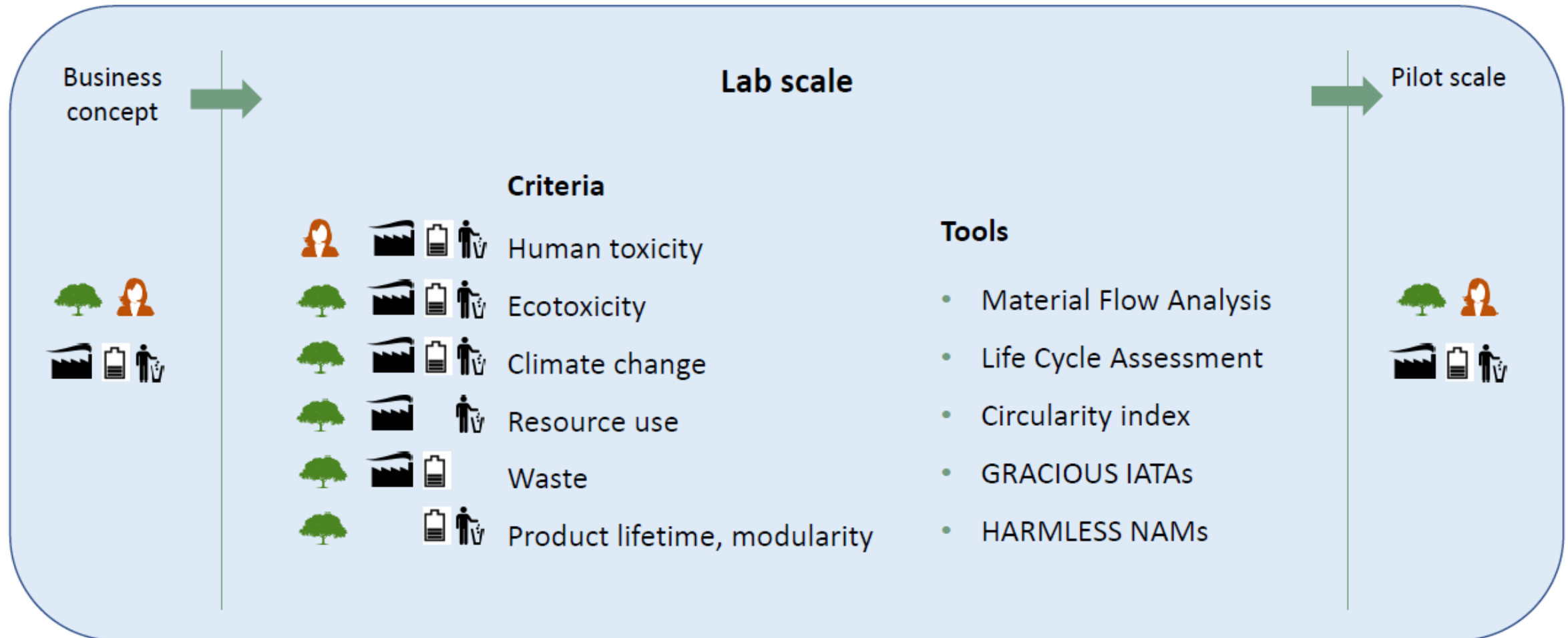
NanoReg²

caLIBRAte
nano risk governance

gracious



SSbD framework



 Social dimension  Environmental dimension

 Production & manufacturing  Distribution & use  End of life

Representing the **Nanotechnology Industries Association:**



**Sean
Kelly**

Responsible Senior Project
Manager at the NIA

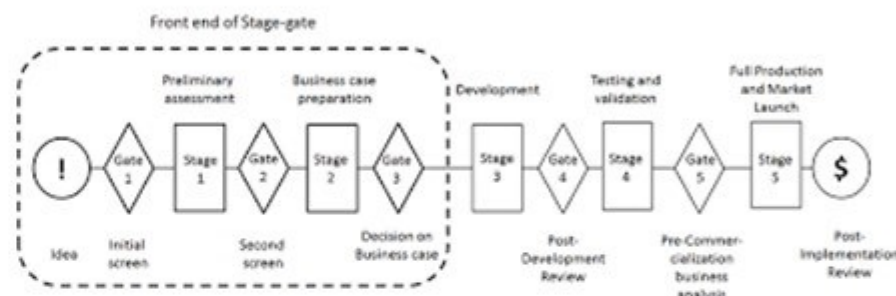


SSbD Workshop 18 February

Sean Kelly
Senior Project Manager

The opinions here are personal to the presenter and do not reflect an official position of the NIA or its members.

- We need to understand what we mean by the terms:
 - Safety
 - Sustainability
 - Design
- SSbD is an attempt to identify decision points along a development process and to help define options for those decisions.
- Balancing cost, safety and functionality is crucial in designing a new nanomaterial or nano-enabled product



What issues do we need to address?

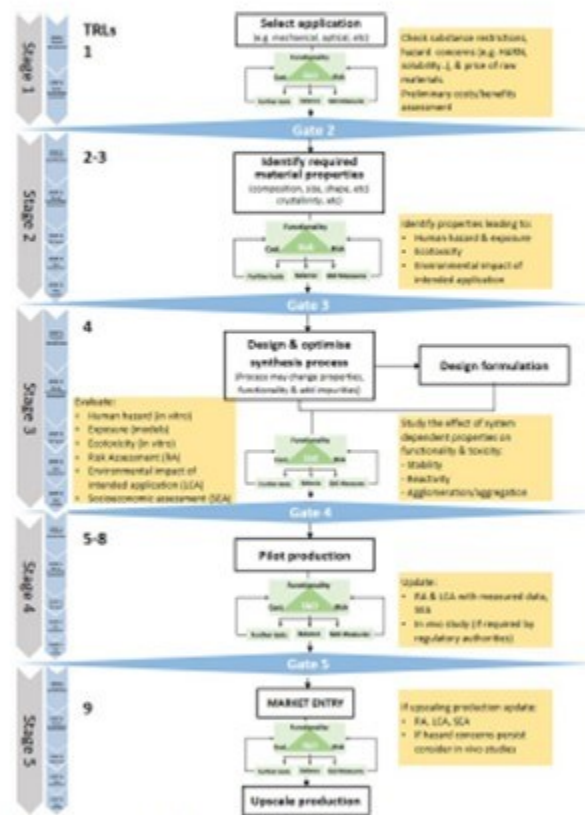
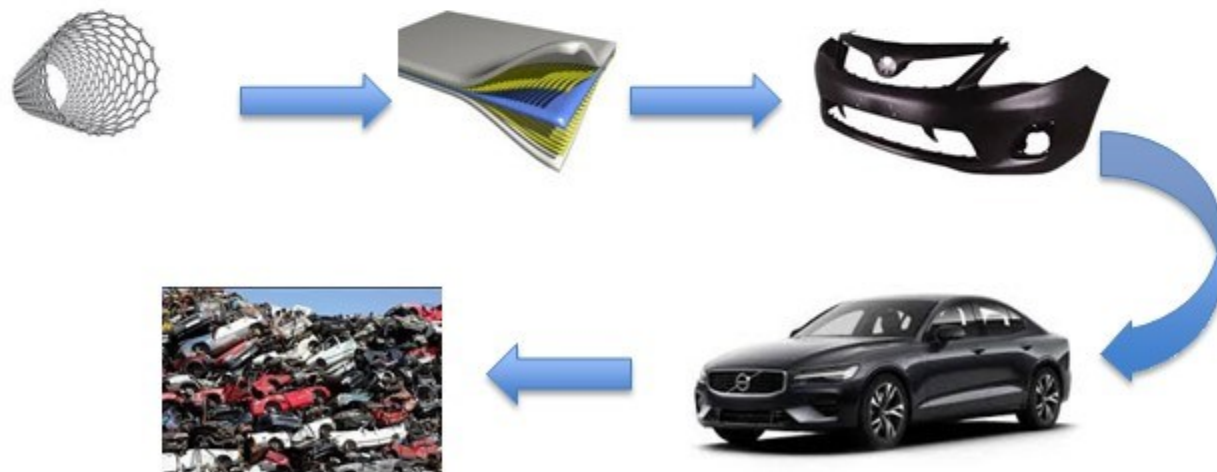


Fig. 1. Flow chart for implementation of NT in the manufacturing of automobiles.
IEA: Life Cycle Assessment; TRL: Technology Readiness Levels.

A. Sanchez Jimenez et al.,
NanoImpact 25 (2022) 100385

- Transition of materials across their life cycle.
- We need to consider both the material development (which TRL) and its passage through the supply chain.
- Who is making the decisions and what scope do they have?



- Do we have the right tools and methods to deploy SSbD in industry?
 - Many of the tools require too much data - not suitable for early stage R&D and thus losing the “by design” element.
 - Can they be deployed without support?
- We need to make it all simpler to implement:
 - Better guidance.
 - More standards/ guidelines that can be followed.
 - Need to include more material scientists (early stage) and process engineers (production stage) in deploying SSbD.
 - We have to explain how to get from idea, to material, to product, to use and eventual end of life for SMEs as well as large companies.
- How do we link SSbD with regulatory compliance?