ASSOCIATION FOR THE ADVANCEMENT OF ALTERNATIVES ASSESSMENT

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International Symposium on Alternatives Assessment Virtual 2020

Current Practices and Future Prospects

October 27-29, 2020

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Session Etiquette

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- During the Q&A portion of the session, if you wish to ask a question or offer a comment, please raise your hand
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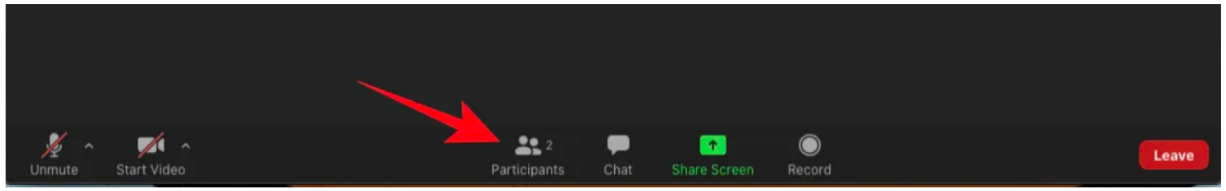
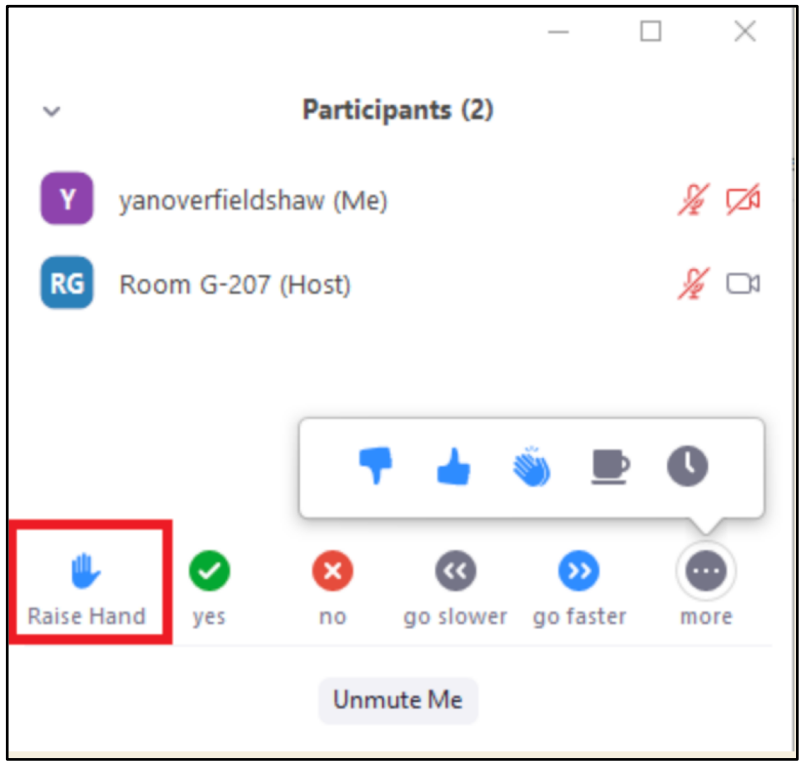
  - Also feel free to use the chat.
- This session is being recorded and will be posted with the slide deck on the A4 website: www.saferalternatives.org

Raising your hand in Zoom





- To “raise you hand”
  - first open the participants icon on the bottom of your computer screen
  - When the participants view opens, you’ll find the “raise hand” icon in the icon list at the bottom.
  - Help us by lowering your hand (toggle the icon) when you finished with your question/comment
- The chat will work too

Symposium Session 3 – Updates from Europe

Part II: Safe-By-Design

Moderator & Panelists

PETER FANTKE

Technical University of Denmark

RONALD FLIPPHI

Dutch Ministry of Infrastructure and Water Management

SØREN BØWADT

European Commission, DG for Research and Innovation

VIVI FILIPPOUSI

CEFIC

Alternatives for chemicals of concern

Towards more effective common interest driven innovation

Ronald Flipphi, Netherlands´ Ministry of Infrastructure and Water Management's, Taskteam Pesticides and Chemical Substances

Implementation of REACH

- improve protection health and environment through better and earlier identification of intrinsic properties chemicals
- enhance innovation and competitiveness EU chemicals industry
- autorisations and restrictions mostly result in substitution by drop-in chemicals
- often replacement of chemicals proven hazardous by chemical not yet proven hazardous
- misinvestments, realisation REACH goals too slow

Proposed new approach

- evaluate chemicals groups by functionality to avoid regrettable substitution
- coordinate substances regulations, research financing, market introduction
- cooperation entire value-chain and others (financials, research, regulators, ...)
- non-chemical solutions
- risk assessment methods allowing for comparing chemical and non-chemical
- FAIR
- Safe-and-Circular-by-Design

Safe Chemicals Innovation Agenda

- Inventory of opportunity for innovation
- right phase, pre-competitive but directed at solutions
- substantial potential for improved protection health or environment
- repellants, fire safety, preservation, pasticising, solvents, surfactants, process regulators (curing agents)
- 7 topics for Horizon Europe financing
- involvement of entire chain
- prolonged scoping to identify end-user needs

Safe-by-design for materials and chemicals

- develop methodologies to integrate non-toxicity and circularity into design processes

- RD&I on technical and scientific challenges where safer alternatives lack

- enabling environment:
  → knowledge exchange
  → education
  → supply chain cooperation
  → safe-by-design as a new interdisciplinary approach

Case: antifouling - background

- Functionality: organisms grow on ship hulls,
- decreasing speed, stability and lifespan
- Increasing fuel use
- historic: copper plating (Vikings), tributyltin (endocrine disruptor), 30% copper coatings
- currently: 10-12% copper coatings (allowed by apparent lack of alternatives)

Case: antifouling - problem

- many alternatives available – hard coatings, slick coatings, fibre, ultrasound, udder ointment (future uv-c)
- currently allowed 10% Cu functions less than 1 season
- pleasure boat owners expect environmentally friendly alternatives to perform worse
- already treat boats in Belgium where more Cu is allowed or buy on internet and self-apply

Case: antifouling – approach

- workshop to commonly determine problem, user needs and knowledge gaps
- test performance of alternatives compared to 10% Cu
- alternatives and 10% Cu, all perform sufficient in fresh water
- all show biofouling in salt water before end of season
- some alternatives are easier to clean
- options differ in cost, lifespan and maintenance efforts

Case: antifouling – follow-up

- communication through boating magazines, on-line information
- informed Competent Authority for admission of biocides
- possibly further test on cleaning options
- investigate if and how cleaning stations may be installed
- perhaps opinion leaders could assist in communication

Case: cash receipts - background

- thermal paper contains developer
- endocrine disruptor BPA
- REACH restriction proposed by France
- substitutes includes mixtures of several bisphenol species (also suspect EDS)
- high exposure cashiers (near safe exposure limit)

Case: cash receipts - problem

- many alternatives can be thought of
  (gloves, screens, button for clients to get receipt themselves, email, electronic signal and app to create receipt on phone)

- little awareness of the high exposure

Case: cash receipts – approach

- research user needs, pros and cons of thermal paper and signal and app alternative

- clients:
  → 90% prefer app (less paper waste, better documentation, no chemicals)
  → 5% never want receipt
  → do not own mobile phone

- shop-owners prefer what clients want

- issues: privacy, cost of change, people without mobile phone, recognition

SUSCHEM
European Technology Platform
for Sustainable Chemistry

A4 Symposium - Day 2, Session 3 ‘Safe-by-Design’

Dr. Vivi Filippousi

SusChem ETP manager, Cefic Innovation manager

Presentation structure

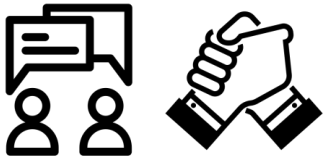
1. SusChem ETP identity - RD& I priorities at EU level;
2. New SusChem Strategic Research& Innovation agenda (from societal to global challenges – towards 2030);
3. Safe- and sustainable-by-design for chemicals and materials (objectives, RD& I and other enabling actions).

Presentation structure

1. SusChem ETP identity- RD& I priorities at EU level;
2. New SusChem Strategic Research& Innovation agenda (from societal to global challenges – H2020 to HEU and beyond);
3. Safe- and sustainable-by-design for chemicals and materials (objectives, RD& I actions and other enabling actions).

SusChem ETP – a European Technology Platform

SusChem ETP focus: Sustainable Chemistry and Industrial Biotechnology



1. Open multi-stakeholders forum

- Mobilizing and bringing together stakeholders from the **large Industry, SMEs,** *startups*, and **Academia (Universities & RTOs)**
- Promote knowledge transfer across the EU

2. Advisory instrument (technology priorities)

- Driving innovation, defining **tech priorities/ solutions** to **global challenges** and **EU priorities**
- **RD&I agendas** to be supported by both private and public funding (EU and national level)

Founding members& SusChem Board

Founded in 2004
6 founding members: Cefic, DECHEMA, ESAB, EuropaBio, GDCh, RSC

SusChem Board*

BASF, SOLVAY, EVONIK POWER TO CREATE, BAYER, CLARIANT, covestro, Solutex, GDCh, ROYAL SOCIETY OF CHEMISTRY, NWO Netherlands Organisation for Scientific Research, DECHEMA Gesellschaft für Chemische Technik und Biotechnologie e.V., EuropaBio The European Association for Bioindustries, cefic, EFCE, VTT

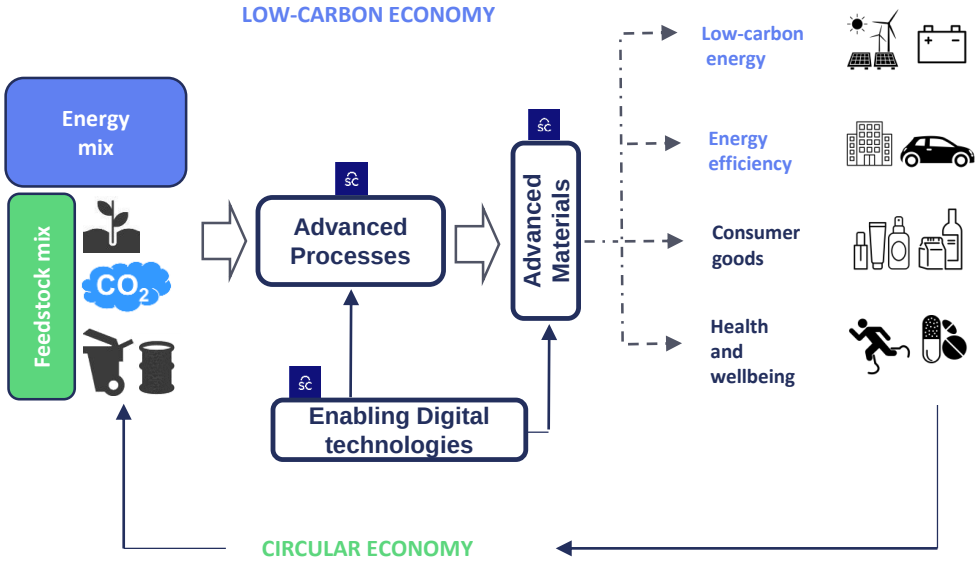
Additional links w DG-Grow and DG-RTD (EC)

SusChem NTPs network
A network across Europe - Bridging National and EU priorities

**17 SusChem NTPs (National Technology Platforms)*

*** NCPs & links with Industry, SMEs and Academia at national level < --- > SusChem ETP*

SusChem& the contribution of Sustainable Chemistry – SusChem KETs



SusChem ETP – a holistic view on:
Sustainable Chemistry & Industrial Biotech

Digital Technologies

Advanced Processes

Advanced Materials

Horizontal topics (e.g. sustainability assessment)

Presentation structure

1. SusChem ETP identity - RD& I priorities at EU level;
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New SusChem SIRA (launch: November 2019): Innovation priorities for global challenges (links w SDGs and Horizon Europe)

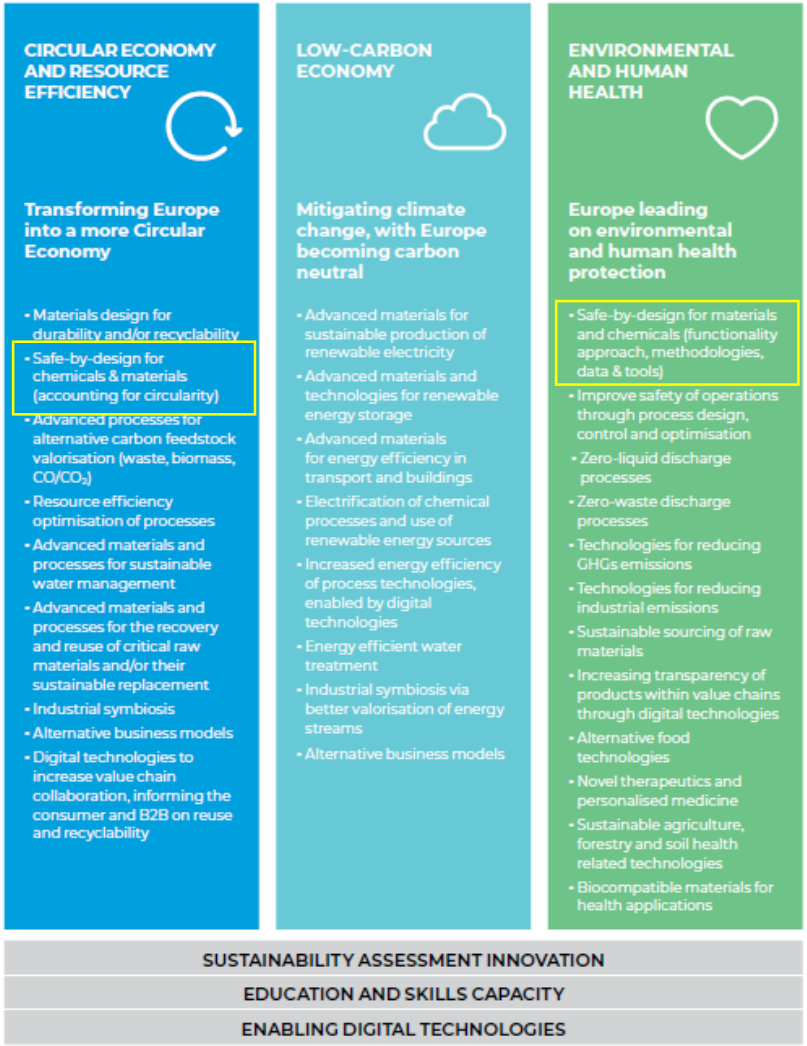
The starting point (2015)

Previous SusChem SIRA: Innovation priorities for societal challenges (links w H2020)

New SusChem SIRA:

- 3 overarching priorities & technological readiness across Advanced Materials, Advanced Processes and enabling Digital technologies.

- Horizontal impact: sustainability assessment innovation, education/skills capacity, safe& sustainable-by-design.

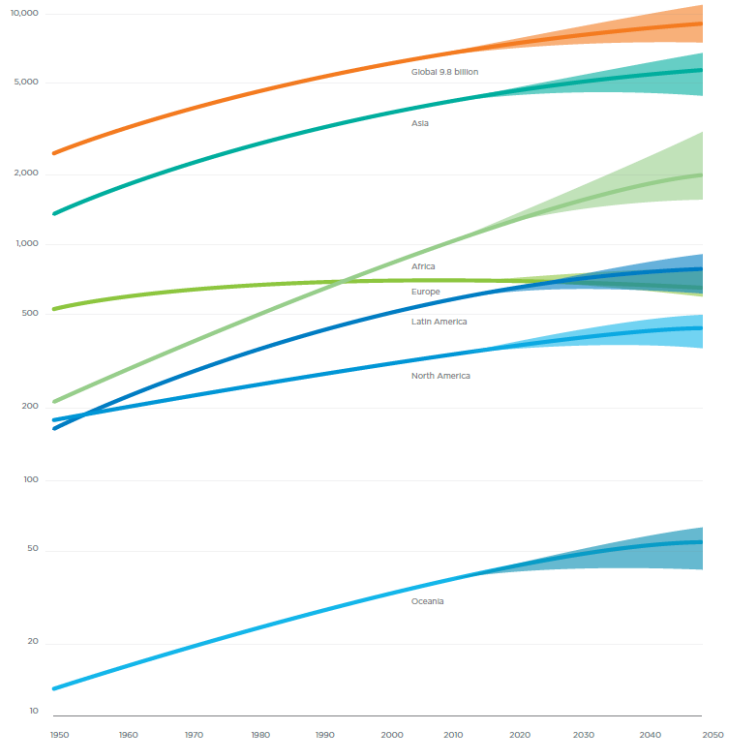


Presentation structure

1. SusChem ETP identity - linking with RD& I priorities at EU level;
2. New SusChem Strategic Research& Innovation agenda (from societal to global challenges – towards 2030);
3. Safe- and sustainable-by-design for chemicals and materials (objectives, RD& I and other enabling actions).

Innovation in a rapidly changing environment – Megatrends

Regional distribution of global population growth
Population of the world and its regions in millions 1950-2050.
Shaded region: low to high variant. Solid line: medium variant.
Source: UN 2015



Graphic Source: Molecule managers, June 2018 , Cefic

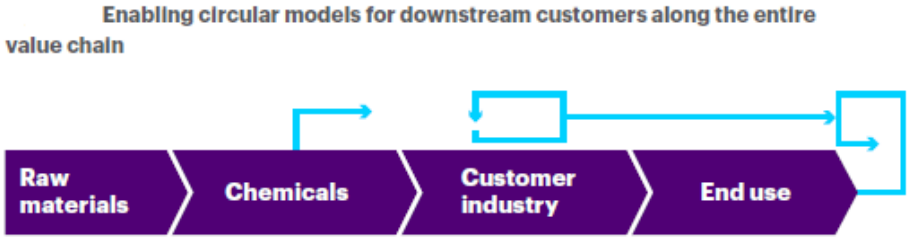
- Global rising population & economic growth.
- Increasing volume of chemicals and chemical-intensive products.*

**2050 forecast: global chemical industry production to triple by mid-century*
[Source: IEA World Energy Outlook 2018]

- Enhanced need to ensure the sustainable use of natural resources but also the safety and overall sustainability of chemicals, materials, products and markets, especially under the global transition to circular economy.

Innovation in a rapidly changing environment – Transitioning to a more circular economy

- The chemical industry produces essential products and technology solutions **for the chemical sector and from the chemical sector** to enable circular models for downstream customers along the entire value chain.



Source: Accenture; Taking the European Chemical Industry, into the circular economy

- Enablers, such as safe-and – sustainable-by design can have a positive influence across the value chain.

Innovation in a rapidly changing environment – Chemicals Strategy for Sustainability (CSS)

- EU Green Deal includes ‘a zero-pollution ambition for a toxic free environment’.
- EU’s chemicals strategy for sustainability (CSS): publication of chemicals strategy (14.10.2020)
- CSS objectives:

  - better protect citizens and the environment

  - boost innovation for safe and sustainable chemicals

- CSS is a **major**, new initiative that will:
  - **Prioritize prevention and substitution**
  - It will **re-define chemicals policy** in Europe
  - Strong move towards **hazard-driven restrictions**
  - **Bring a shift to safe and sustainable by design**
- Safe and sustainable-by-design definitions (safe- first) - need to harmonies criteria and assessment methodologies.

‘Safe-by-design’ for chemicals and materials – need for clear objectives

Key starting point and contribution for SusChem:

van der Waals J.F.M., Falk A., Fantke P., Filippousi P., Flipphi R.C.H., Mottet D., Trier X. (2019).
‘Safe-by-design for materials and chemicals: Towards an innovation programme in Horizon Europe’.

June 24, 2019 Working paper Open Access

Safe-by-design for materials and chemicals

van der Waals, Jochem; Falk, Andreas; Fantke, Peter; Filippousi, Paraskevi; Flipphi, Ronald; Mottet, Denis; Trier, Xenia

Non-paper Safe-by-design of materials and chemicals: Towards an innovation programme in Horizon Europe

In the global transition to a safe and circular economy, the EU can play a leading role by developing innovative, safer and sustainable materials, chemicals, products and services. EU innovation policy, as a complement to chemicals policy, could stimulate the development and adoption of such innovations.

An informal working group of experts from government, academia and industry has developed a non-paper about the main topics for an innovation programme, in Horizon Europe or other European programmes, that could accelerate the design, development and adoption of safer alternatives to new and existing applications (materials, chemicals, products and services) where safety hazards (may) arise. The document proposes three funding areas for a Horizon Europe programme:

- developing and improving methodologies for safe (re)design of chemicals and materials to ensure that toxicity and other lifecycle considerations (including circularity) are integrated into design processes;
- thematic Research, Development and Innovation (RD&I) to overcome technical and scientific challenges in areas where it has been difficult to find safer alternatives;
- creating an enabling environment: Knowledge exchange, education and supply chain cooperation to set up safe-by-design as a new interdisciplinary approach.

van der Waals J.F.M., Falk A., Fantke P., Filippousi P., Flipphi R.C.H., Mottet D., Trier X. (2019). Safe-by-design for materials and chemicals: Towards an innovation programme in Horizon Europe.

Feedback and inclusion as a Horizontal topic in the new SusChem SIRA.

‘safe & sustainable-by-design’ concept: an innovation opportunity

- In line with Sustainable Chemistry objectives.
- An **innovation opportunity** (e.g. materials and process levels).
- An opportunity for the EU to take the lead in circular economy transition by developing innovative, safe and sustainable materials, chemicals, products and services for new or existing applications.

Setting objectives

A functional approach

- ❑ Beyond drop-in replacements and towards ‘safe/sustainable-by-design’.
- ❑ Innovate from molecular level to higher levels: materials, products, processes and business models.

Minimizing toxicity and combine with overall sustainability improvements (full lifecycle perspective)

- ❑ Minimize toxicity *(including persistency, bio-accumulation, and products of incomplete degradation/mineralization).*
- ❑ Safety broader than chemical toxicity, including microbiological safety and biosafety, when expanding to biotech.
- ❑ Full life cycle perspective – consideration of combining with overall sustainability improvements.

Innovation as a multidisciplinary approach

- ❑ Systemic thinking.
- ❑ Multi-disciplinary approach: e.g. chemistry, biology, toxicology, sustainability assessment, product, materials and process design.
- ❑ Extending to the integration of enabling digital technologies (from materials/process design to transparency in value chains).

An integrated and collaborative network

- ❑ Cross-value chain collaborations and communication: from chemicals and materials producers, to brand owners and end-users.
- ❑ Contribution of the full innovation ecosystem.
- ❑ Knowledge sharing across sectors.

Meeting the objectives – Actions overview

1. **Thematic research, development and innovation** driven by **functionality** relevant to **materials, formulations and industrial processes;**

2. **Methodological development or improvement** for any (re)design of chemicals and materials (integration of circularity);

3. **Creating an enabling environment: knowledge development, networks formation and education** (focused RD& I actions and embedding a wider strategy).

1. Addressing thematic areas for RD& I – functional approach

Innovating on material structures, product and process improvements can be given more emphasis

[functional substitution and safe/sustainable-by-design concepts – avoiding 'regrettable substitution']

Materials

- Water, Grease and dirt repellence
- Fire safety
- Plasticizing

Processes

- Process functions provided by solvents
- Process regulation
- Surface protection

Formulations

- Preservation
- Functions provided by surfactants

**List not being exhaustive*
*** recognizing overlaps between amongst thematic cluster might exist*
****applicability to thematic areas where hard to solve safety concerns arise*

1. Example - Addressing thematic RD& I – Materials functional approach

MATERIALS	
WATER, GREASE AND DIRT REPELLENCE	• New materials design approaches to achieve inherent repellence performance. • Innovative repellent materials, using alternative chemicals with positive scores on safety and ability to mineralise.
FIRE SAFETY	• Innovative materials with inherently flame-resistant function. • Materials design to reduce additive exposure/leaching to the environment (intermediate solution).
PLASTICISING	• Innovative materials with the same functionality (flexibility, durability) in the absence of hazardous additives (in final product and production process). • Novel, safe and sustainable material/alternative chemical combinations with plasticising functions.

2. Addressing methodological development or improvements

Validated and harmonized tools
- *de novo* design
- *a priori* design
- In silico approaches
- Addressing full lifecycle

CRITERIA AND TARGETS	• Harmonised and validated criteria and science-based targets for safety and broader sustainability for the full life cycle of chemical/material/product/service, also addressing circularity; • Criteria, targets and methods applicability early in the (re)design process of chemicals and materials, ensuring consistency in evaluation and early stage prioritisation.
EFFICIENT 'PREVENTIVE' TOXICOLOGY AND LIFE CYCLE TOOLS	• Efficient/flexible digital tools for integrating knowledge of toxicity into early design to evaluate safety impact ('Preventive' vs. 'predictive' toxicology); • Allow for more complex assessment via multiparametric toxicity but also LCA models (integration of risk assessment, LCA methodologies and circular design).
ACCESSIBLE DATA	• Make data available for designers [criteria for Findable, Accessible, Interoperable and Reusable (FAIR) data, open access databases]]; • Development of transparent, efficient and reliable methods to allow information transfer along supply chains (data sharing platforms).
STANDARDISATION	• Involve standardisation bodies to ensure optimum use of standards and development of new standards (data, methods, tools).

3. Creating an enabling environment

KNOWLEDGE DEVELOPMENT, NETWORKS AND EDUCATION	• Landscape analysis of existing disciplines, networks and organisations; • Network building as an objective or condition in funded projects; • Higher education, workshops, challenges and competitions, bootcamps, educational networks as start of a process of internalising safe-by-design in education and skills development.
SUPPLY CHAIN COOPERATION AND COORDINATION	• Scoping phase with stakeholders before technical research to: - Analyse context of the innovation (potential barriers); - Identify user needs and performance criteria; - Identify appropriate levels of research (materials, processes, products, chemicals); • Data and knowledge sharing platforms across value chains and different sectors.

Overall stakeholders considerations

- Need for compatibility between safety and functionality (production and final product).
- Drive for long-term vs. short-term and intermediate solutions.
- Hand-in-hand with criteria and methodological development.
- Account for transition to Circular Economy and the emerging element of feedstock composition variability.
- Accounting for overall sustainability profile.
- Integration of enabling digital tools.
- Ensure scalability of solutions to achieve maximum impact.

SUSCHEM
European Technology Platform
for Sustainable Chemistry

Thank you

Contact: vfi@cefic.be or suschem@suschem.org

Back-up slides

Expected impact (SDGs & HEU) – ‘sustainable-by-design’

- Examples of most relevant SDGs include:

- links **with Horizon Europe (HEU) pillars**, and beyond (e.g. LIFE), e.g.

opportunities in Pillar II (Global Challenges and European Industrial Competitiveness), in particular clusters: ‘Health’ (1), Food, Bio-economy, Natural Resources, Agriculture and Environment’ (6)‘ and especially Digital, Industry and Space’ (4) (*e.g. Advanced Materials IA*)*

A4 Symposium

Session 3- Safe by Design

The European Green Deal and the Chemical Strategy for Sustainability

Dr. Soren BOWADT – Deputy Head of Unit
Unit Materials for Tomorrow
DG Research and Innovation
European Commission

Our vision

A sustainable, fair and **prosperous** future for **people** and **planet** based on European values.

- Tackling **climate change** (35% budgetary target)
- Helping to achieve **Sustainable Development Goals**
- Boosting the Union's **competitiveness and growth**

European Commission

- **H2020** new proposed call topics: closing the carbon cycle to combat climate change, circular economy, and zero pollution
- **Horizon Europe Framework Programme** new topics in context with the Green Deal

European Commission

EU Chemicals Strategy for Sustainability

- The Chemicals Strategy will:
  - **Ensure better protection** of human health and the environment from hazardous chemicals
  - **Boost innovation** for safe and sustainable chemicals
  - Enable the transition to chemicals that are **safe and sustainable by design**

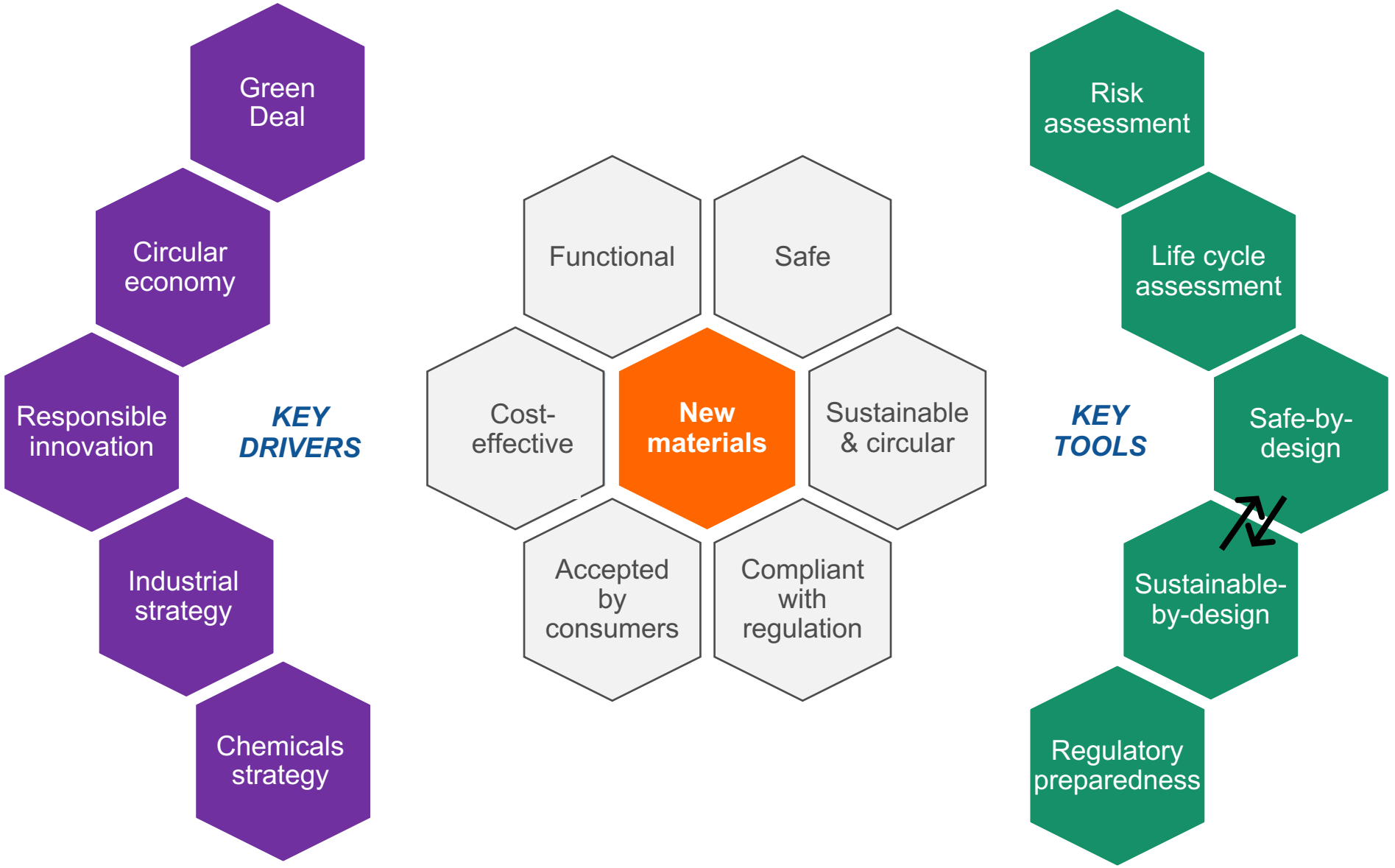
It is a first step towards the **Zero pollution ambition** for a toxic-free environment announced in the **European Green Deal**.

Key actions in the Chemicals Strategy

- **Banning the most harmful chemicals** in consumer products - allowing their use only where essential
- **Account for the cocktail effect of chemicals** when assessing risks from chemicals
- **Phase out per - and polyfluoroalkyl substances (PFAS)** in the EU, unless their use is essential
- **Boost the investment and innovative capacity** for production and use of chemicals that are **safe and sustainable by design** throughout their life cycle
- **Promote EU's resilience of supply** and sustainability **of critical chemicals**
- Establish a simpler "**one substance one assessment**" **process** for the risk and hazard assessment of chemicals
- **Play a leading role globally** by championing and promoting high standards and not exporting chemicals banned in the EU

"Moving to safe and sustainable-by-design chemicals is crucial for human health and the environment, Research and Innovation will lead the way"

Safe and Sustainable Innovation



Gottardo et al. Towards safe and sustainable innovation in nanotechnology: state-of-play for smart nanomaterials, 2020, submitted for publication

Sustainable-by-Design

Our current thinking

- *Support to European policy goals and priorities*
- *Systems approach with sustainability criteria governed by societal empowerment, industrial relevance and regulatory preparedness*
- *Comprehensive concept of sustainability driven by safety, circularity and functionality of materials and products through their lifecycle*
- *Aligning actors across value chain on sustainability criteria*

Materials Sustainable-by-Design

Reduce time required for R&D

More cost effective innovation

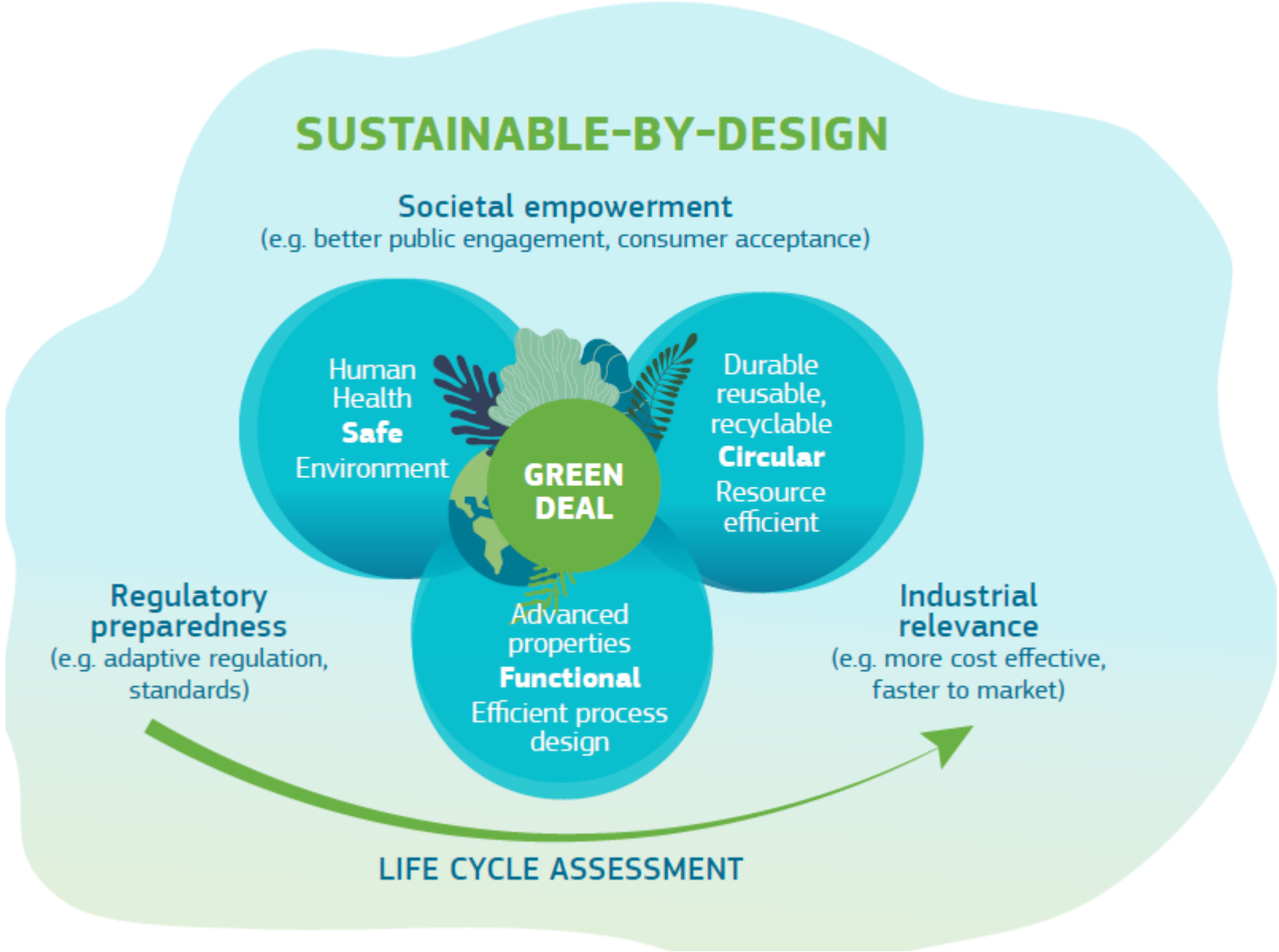
Faster to market

Prepare for future regulatory challenges

Safer, circular, functional products

Better consumer acceptance

European Commission



European Commission

Towards Sustainable-by-Design

How to develop underlying criteria?

- *Who should lead the process of criteria development?*
- *Do we have or need to develop the knowledge base?*
- *Which stakeholders should be involved in the criteria setting?*
- *Which endpoints should such criteria take into account with regards to human and environmental toxicity?*

Implementation plan

- *Initial calls in 3 priority areas to test the concept in first 2 years of HE based on potential for impact and urgency*
- *Prepare future standardization and testing activities*

Potential Sustainable-by-Design topics (2021-22)

Potential Topic Title
Safe and sustainable by design polymeric materials (RIA)
Cost-effective eco-friendly metallic coatings and engineered surfaces for multi-industrial sector applications (RIA)
New, sustainable and safe by design organic coatings (RIA)
Establishing EU wide sustainable-by-design materials community to support embedding sustainability criteria over the life cycle of products and processes (CSA)

Potential nano-related topics (2021-22)

Potential Topic Title
Innovative materials for advanced nanoelectronic components and systems (RIA)
Antimicrobial, antiviral, and antifungal nanocoatings (RIA)
Novel and improved materials for green nanoelectronic components and devices for industrial applications (RIA)
Advanced characterisation methodologies to assess and predict the health and environmental risks of nanomaterials
New catalytic materials for a distributed production of low-carbon fuels and chemicals in advanced photoelectrocatalytic devices

Strategic plan gives direction to the work programme

Main Features

Early involvement and extensive exchanges with Member States
Extensive exchanges with the European Parliament
Consultations with stakeholders and public at large

Up Next After 30-Minute Break

Symposium Session 4 – Industry Experience Implementing Alternatives Assessment and Substitution

Part II: Lessons learned from small business users of chemicals

Moderator: Pamela Eliason, Massachusetts Toxics Use Reduction Institute

Panelists:

- Jamie delos Santos, Burien Auto Rebuild
- Adam Pearson, Merrimack Ales
- Scott Song, Family Dry Cleaners

Use Zoom Link for Session 4 [requires registration]

Join Us Thursday

Symposium Session 5

Part I: Considering Uncertainty: Real-world strategies to make decisions

Moderator:

Tim Malloy, University of California Los Angeles

Panelists:

- Shari Franjevic, Clean Production Action/GreenScreen®
- Tom Lewandowski, Gradient
- Martin Wolf, Seventh Generation

Symposium Session 6

Part II: Considering Trade-offs: Real-world strategies to make decisions

Moderator:

Molly Jacobs, University of Massachusetts Lowell

Panelists:

- Matteo Kausch, Cradle to Cradle Products Innovation Institute
- Tom Lewandowski, Gradient
- Heather McKenney, The Honest Co.
- Mallory McMahon, The Honest Co.
- Martin Wolf, Seventh Generation


Thank you for
joining us!