

The Chemicals strategy

- what is the importance to the EU and its citizens?



Europe is the second largest producer with **16.9%** of global sales



EU chemicals industry employs **1.2 million** people



59% of chemicals supplied to other sectors, such as health, constructions, automotive, electronics, textiles



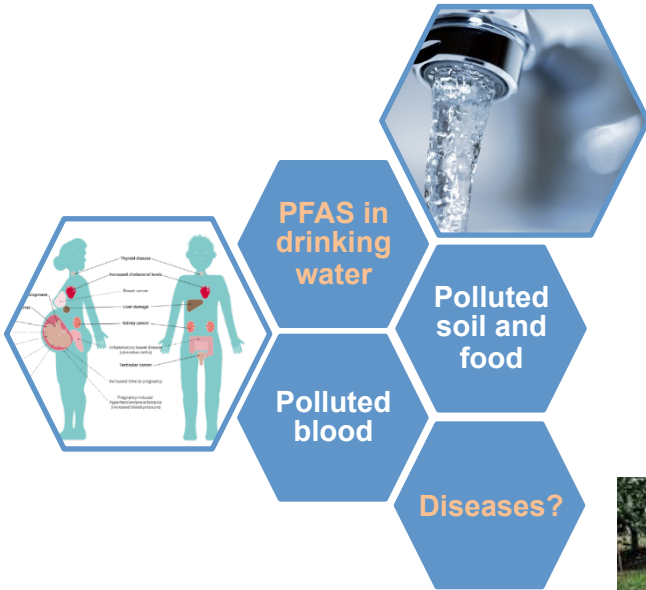
84%
Europeans are worried about the impact of chemicals present in everyday products on their health



90%
Europeans are worried about the impact of chemicals on the environment

- an example..

Soil improvers that contaminated a German community with PFAS



with PFAS



EEAs work on chemical pollution

- and call for safer chemicals..

Networks:
ETC, EPA,
EIONET

Advisory

Bilateral
discussions

Inputs to
texts and
processes,
EC/Nat./
Scientific

Articles

Conferences

Workshops

Reports,
briefings

Chemicals for a sustainable future
Report of the EEA Scientific Committee Seminar
Copenhagen, 17 May 2017



Environment and health

Chemicals

Emerging chemical risks in Europe — 'PFAS'

It is currently not possible to perform in-depth environmental and health risk assessments of chemical substances in use in Europe because of the great variety of chemicals and their uses. New and legacy chemicals continue to be released into Europe's environment, adding to the total chemical burden on Europe's citizens and ecosystems. Early identification is one of the activities of the European Environment Agency (EEA). This is known and potential risks to human health and the environment in Europe very persistent chemicals, the per- and polyfluorinated alkyl substances (PFAS).

European Environment Agency



Environmental
Science
Processes & Impacts

CRITICAL REVIEW

Check for updates
Cite this Article: Sci. Process. Impacts, 2023, 25, 1803

The concept of essential use for determining when uses of PFASs can be phased out

Ian T. Cousins, Gretta Goldenman, Dorte Herzke, Rainer Lohmann, Mark Miller, Carla A. Ng, Sharyle Patton, Martin Scheringer, Xenia Trier, Lena Vierke, Zhanyun Wang, and Jamie C. DeWitt

Because of the extreme persistence of per- and polyfluoroalkyl substances (PFASs) and their associated risks, the Madrid Statement argues for stopping their use where they are deemed not essential or when safer alternatives exist. To determine when uses of PFASs have an essential use, the Madrid Statement provides a framework for decision-making.

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pubs.acs.org/perspectives

Global Perspective

Scientific Basis for Managing PFAS as a Chemical Class

Carol F. Kwiatkowski, David Q. Andrews, Linda S. Birnbaum, Thomas A. Bruton, Jamie C. DeWitt, Delfer R. U. Knaebe, Maricel V. Maffini, Mark F. Miller, Katherine E. Pelch, Anna Reade, Anna Soehl, Xenia Trier
Int. J. Environ. Res. Public Health 2018, 15(10), 2085.
<https://doi.org/10.3390/ijerph15102085> (registering DOI)

Open Access

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ACCESS

ABSTRACT

class the they

also includ

June 24, 2019

Madlen David, Gudrun Koppen, Jos Bessems, Denis Sarigiannis, Marika Kolossa-Gehring

Working paper

Safe-by-design for materials and chemicals

van der Waals, Jochem, Falk, Andreas, Fantke, Peter, Filippoussi, Paraskevi, Ronald, Mottet, Denis, Trier, Xenia

Horizon Europe

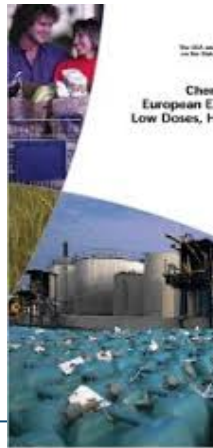
Non-paper Safe-by-design of materials and chemicals: Towards an innovation programme

In the global transition to a safe and circular economy, innovative, safe and

play a leading role by developing services. EU innovation and adoption of such

and industry has developed in Europe or other European services) where safety hazards on Europe programme:

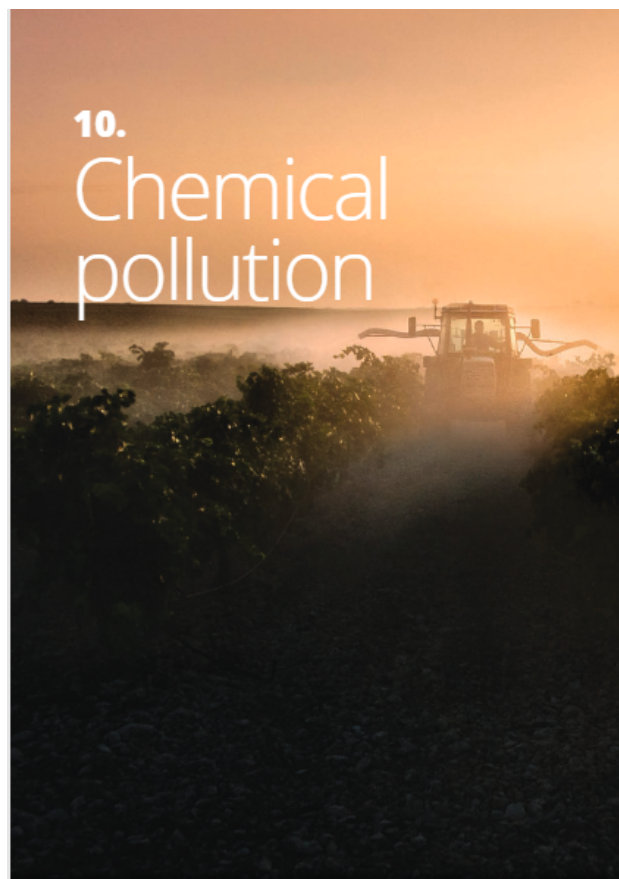
chemicals and materials (circularity) are integrate



EEAs State and Outlook on the Environment SOER2020



<https://www.eea.europa.eu/publications/soer-2020>



https://www.eea.europa.eu/publications/soer-2020/chapter-10_soer2020-chemical-pollution/view

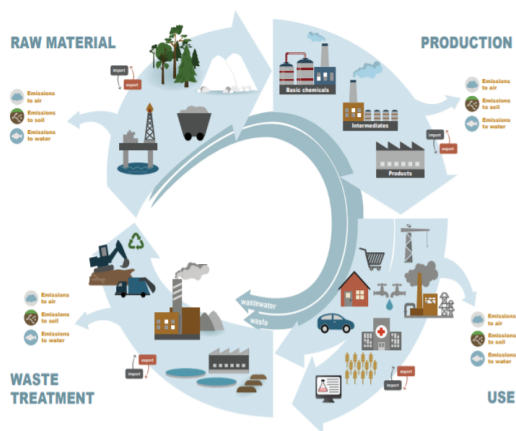


European Environment Agency

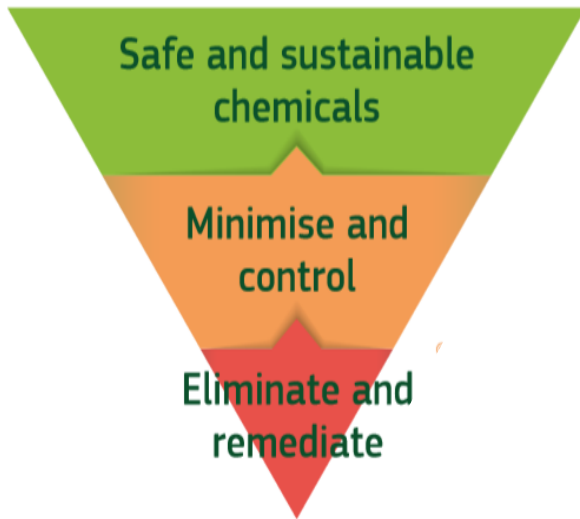


SOER2020: Systemic view on chemical pollution

- Human activities lead to point source and diffuse chemical pollution
- Pollution occurs along lifecycles and moves across boundaries
- Accumulation of chemicals and effect of particular concern, e.g. PFAS
- Total burden of mixtures of chemicals impacts people and environment
- Risk assessment cannot keep up with diversity of chemicals/exposures
- **Upstream prevention most effective to avoid harm to planet and people**
=> *reduce complexity, and transition to safe and circular by design!*



The EU Chemicals Strategy for Sustainability (CSS) towards a toxic-free environment



1. Chemicals are produced/used in a way that maximises their benefits to society while **avoiding harm to planet & people**
2. Production and use of **safe and sustainable chemicals** becomes the EU market norm and a global standard

Credit: Elena Montani, DG ENV

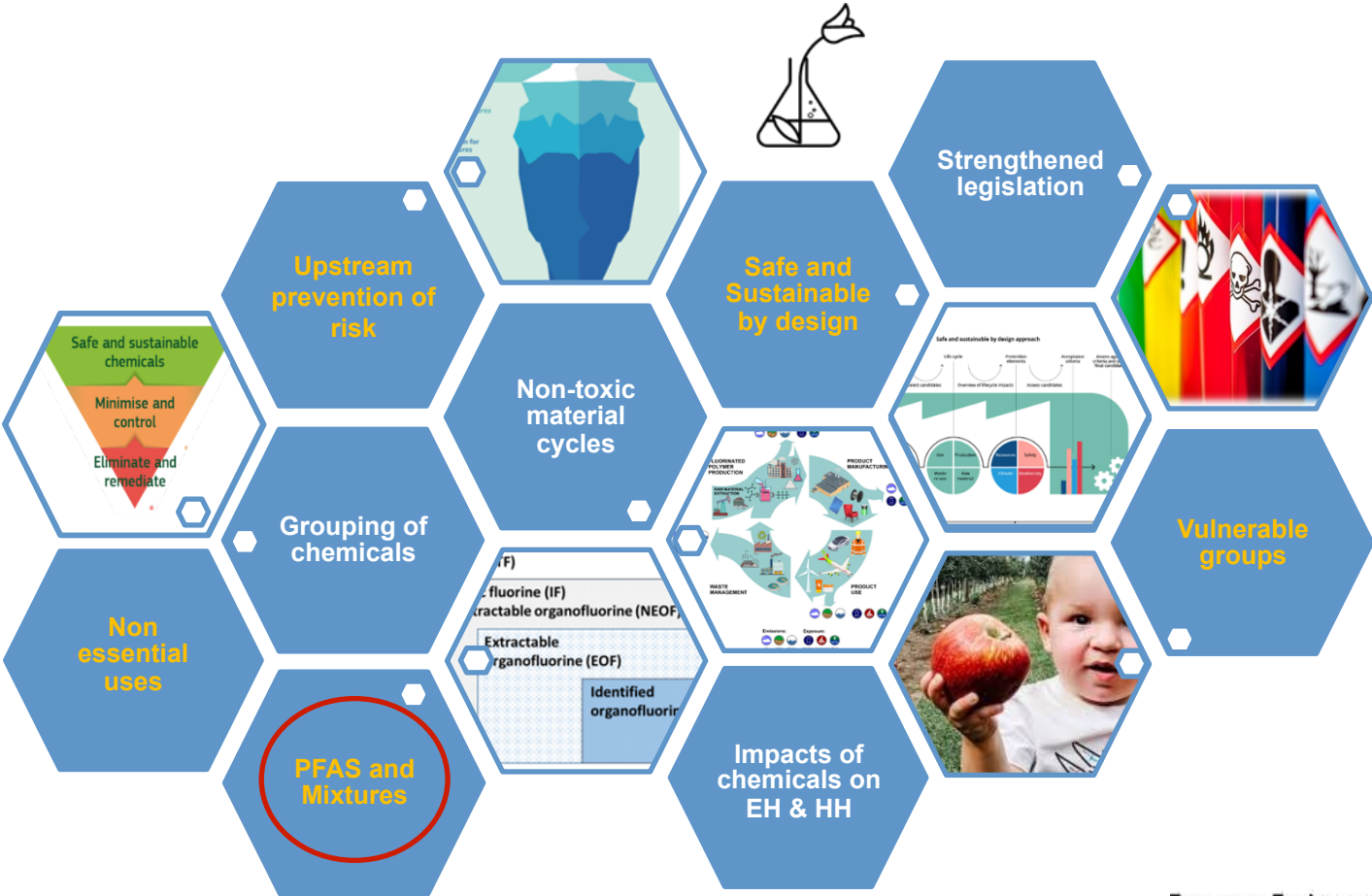
Documents:

- **The Chemical SS:** https://ec.europa.eu/environment/strategy/chemicals-strategy_en
- **Annex to CSS with actions and timelines:** <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2020%3A667%3AFIN#document2>
- **Mixtures staff working document (SWD):** https://ec.europa.eu/environment/pdf/chemicals/2020/10/SWD_mixtures.pdf
- **PFAS staff working document (SWD):** https://ec.europa.eu/environment/pdf/chemicals/2020/10/SWD_PFAS.pdf

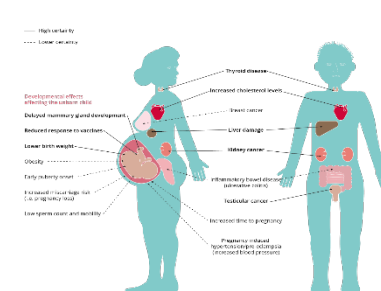
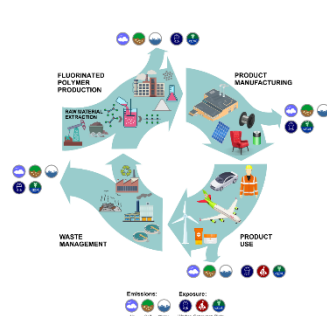
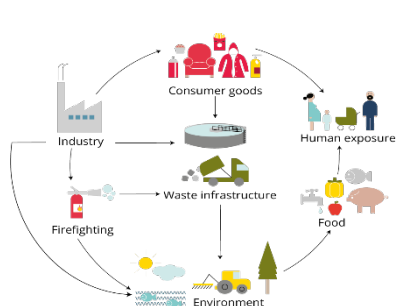


Avoiding harm to planet and people

The EU Chemicals Strategy for Sustainability – focus areas



Multiple lines of evidence of harm of PFAS



- >5000 PFAS
- Widespread PFAS uses (200 use categories)
- Emission along lifecycles
- PFAS incl. degradation products are persistent
- PFAS accumulate
- Many PFAS have Planetary Boundary Threat characteristics
- Toxic – various types, mixtures, severe effects
- Costly – diseases, ecosystem services, remediation, house prices

¹ EEA (2019): Emerging risks in Europe – PFAS: <https://www.eea.europa.eu/publications/emerging-chemical-risks-in-europe>

² Kwiatkowski et al.(2020): Scientific basis for managing PFAS as a chemical class

³ Glüge et al. (2020): An overview of the uses of per- and polyfluoroalkyl substances (PFAS): <https://pubs.rsc.org/en/content/articlelanding/2020/em/d0em00291g#!divAbstract>

⁴ EEA (2021): A systemic view of impacts of fluorinated polymers across their lifecycles (*forthcoming*).

⁵ Diamond et al. (2015): Exploring planetary boundary threats from chemical pollution



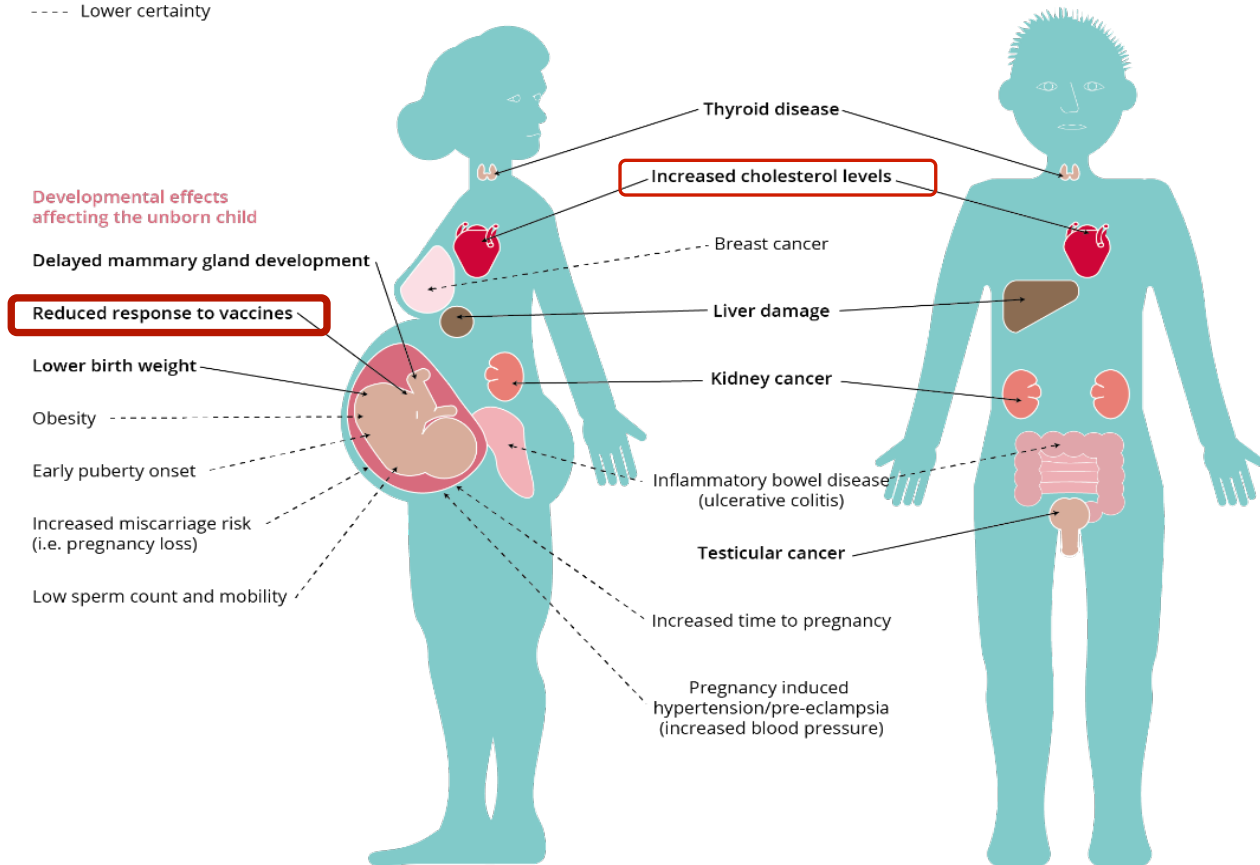
What are the human health concerns of PFAS?

- **Toxic** – various types of toxicity (eg PFOA, PFOS, FTOHs, diPAPs ..) ^{3,6}

- **Costs** –

- health, remediation, property, company liability, environment ⁷
- Estimated annual health costs: **52-84 bio EUR/year in Europe⁷**

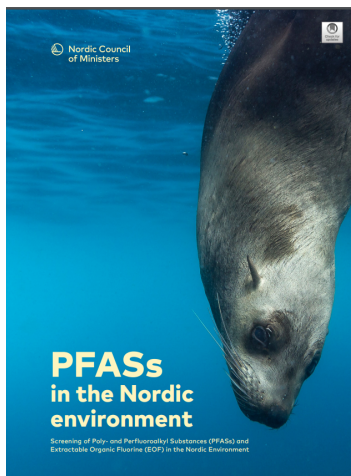
— High certainty
 ---- Lower certainty



Sources: EEA, *Emerging chemical risks in Europe – PFAS*, inputs from Jamie deWitt. Primarily based on the toxicological profile for perfluoroalkyls ([US ASTDR 2018](#)); the US Monograph on Immunotoxicity ([National Toxicology Program, 2016](#)), Cancer studies ([C8 Health Project Reports 2012](#), [IARC 2017](#), [Barry, 2013](#)), and developmental effects ([Fenton 2009](#), [White 2011](#)). The sources evaluated one or more of the substances: PFOA, PFNA, PFDeA, PFOS, PFHxS, PFOSA, Me-PFOSA-AcOH. ⁶ Rosenmai et al. (2016) Fluorinated alkyl substances and technical mixtures in food paper-packaging exhibit endocrine-related activity in vitro. ⁷ Nordic council of ministers: Cost of inaction of PFAS. <http://norden.diva-portal.org/smash/get/diva2:1295959/FULLTEXT01.pdf>

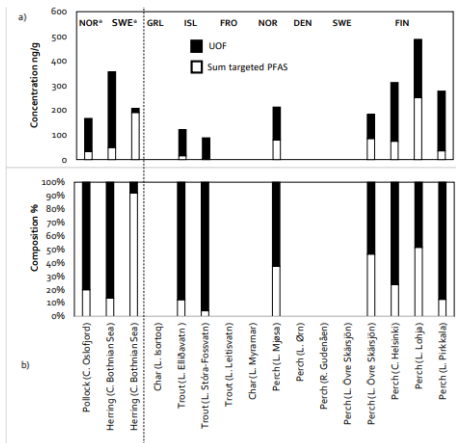


Managing vs. risk assessing **class of PFAS**

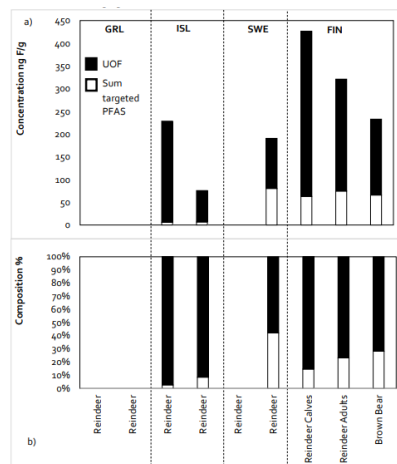


- **Black:** Unidentified PFAS
- **White:** Identified PFAS
- **Risk managing the class of PFAS**
 => **Early Actions on Early Warnings**
 => may be supported by risk assessment, but **full risk assessment** for each of >5000 PFAS would delay action

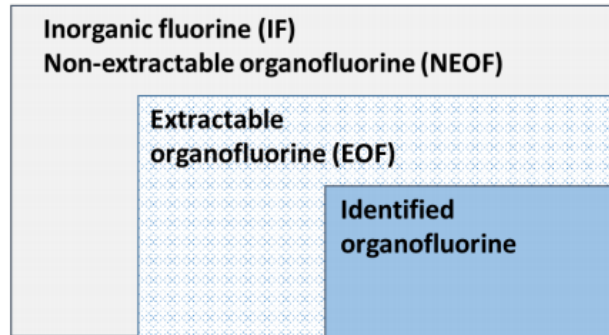
Fish



Terrestrial Mammals



Total fluorine (TF)



Addressing groups and classes of PFAS in Europe

EU Drinking water directive (DWD) ¹

- 20 single PFAS (some PFAS) ²
- **Total PFAS (sum/class of PFAS)** ³

EFSA opinion: Risk of PFAS in food ⁴

- **Group of PFAS:** PFOA, PFNA, PFHxS, PFOS
- **Tolerable weekly intake (TWI) =**
4.4 ng PFAS/kg bw/week
- **Protecting:** Children year 0-1, breastfed.
Levels set for PFAS levels in mothers

Market place and industry

- From PFOA-free to **PFAS/PFC-free**
- In food contact materials, textiles, cosmetics, sports equipment, etc.
- Small and large business^{1,2}, ChemSec business group (e.g. COOP, H&M, ..)
- 2021: **Danish Industry pledges to phase out all non-essential uses of PFAS** ⁵

¹ EC 2020 (DWD). <https://data.consilium.europa.eu/doc/document/ST-5813-2020-INIT/en/pdf>

² EC Oct 31st 2020: C4-C13 PFCA, C4-C13 PFSA. 100 ppt (0.1 ug/L) for 'Sum of PFAS'.

³ 0.5 ug organic fluoride/L water. Method to be decided, e.g. Extractable organic fluorine cobustion ion chromatography (EOF-CIC). *After adoption (2020), '...once technical guidelines for monitoring this parameter are developed in accordance with Article 11(6). Member States may then decide to use either one or both of the parameters 'PFAS Total' or 'Sum of PFAS'*

⁴ EFSA 2020:

<https://www.efsa.europa.eu/en/news/pfas-food-efsa-assesses-risks-and-sets-tolerable-intake>

⁵ Danish Industry 2021.

[CHEMICALS IN A SUSTAINABLE FUTURE – AN INITIATIVE FROM DI. THE Confederation of Danish Industry. Short version \(danskindustri.dk\)](#)



Risk Governance: Consideration of aspects beyond risk assessment

- *International Risk Governance Council framework*

IRGC. (2017). An introduction to the IRGC Risk Governance Framework

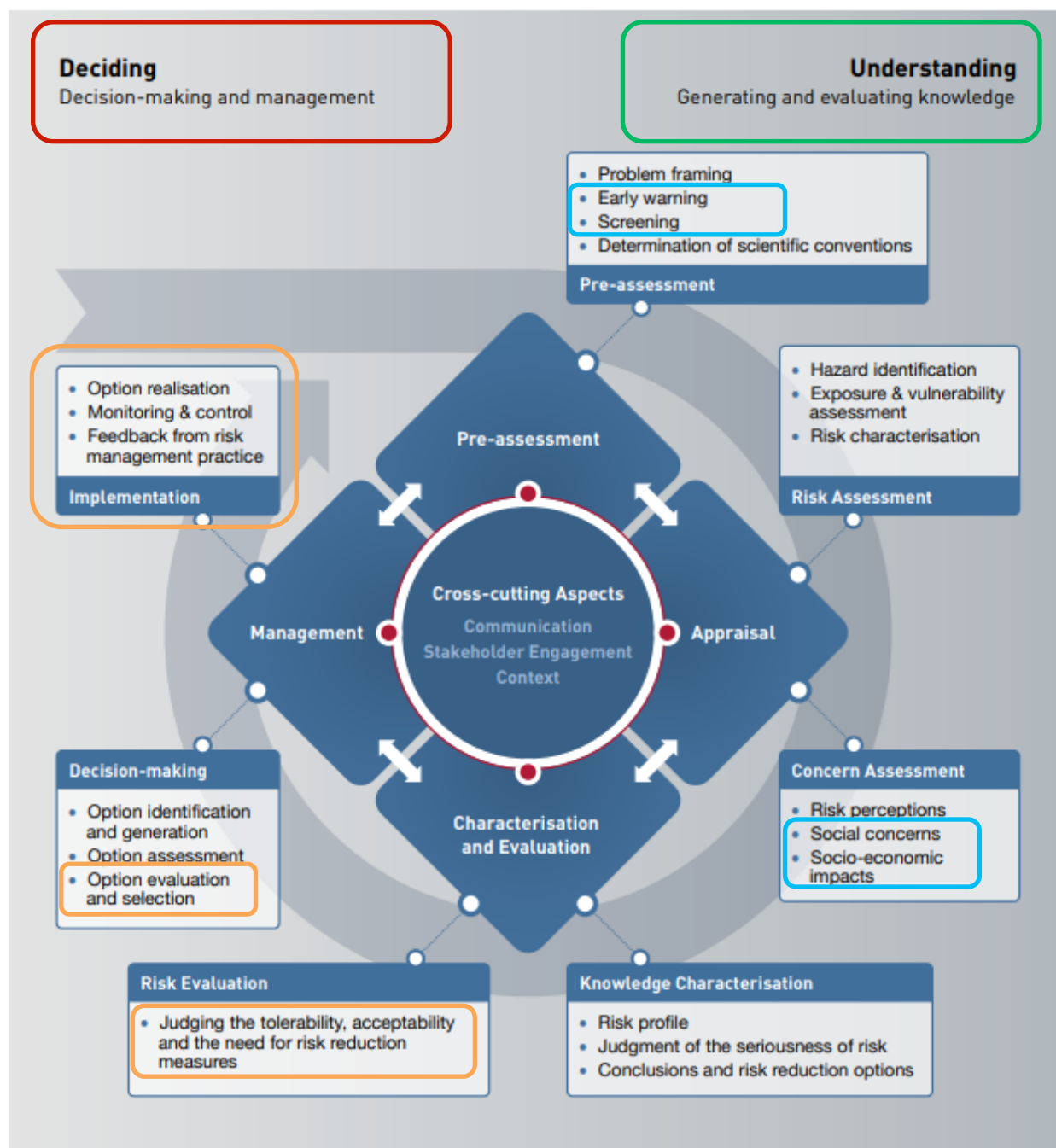
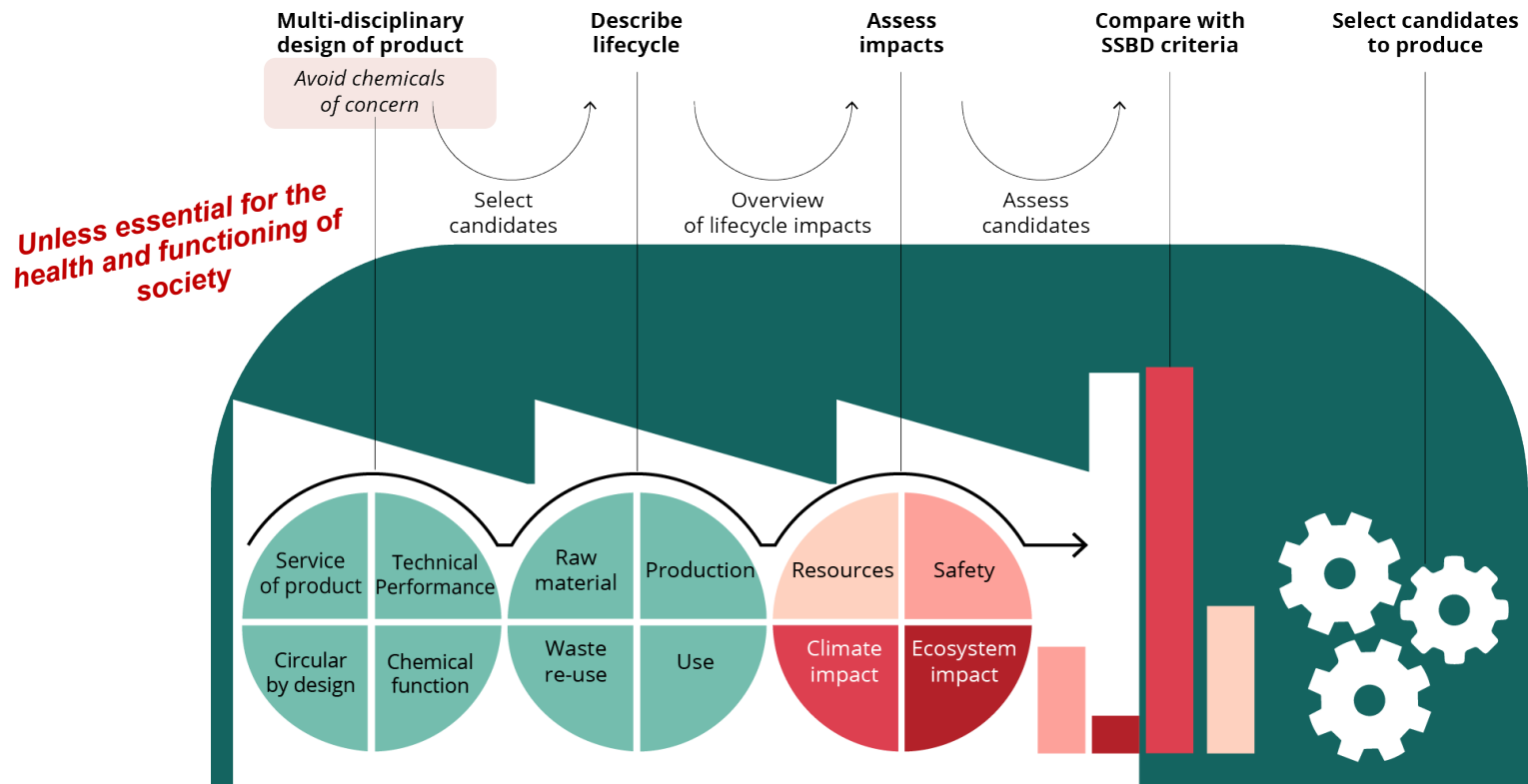


Figure 2: Detailed visual representation of the IRGC Risk Governance Framework.



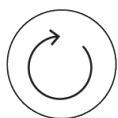
Safe and Sustainable by Design design approach



Example: prototyping a waterproof material



Design/select a few prototypes to 'keep dry'



Describe impacts of prototypes



Calculate impacts of prototypes



Compare impacts of prototypes against criteria



Select and manufacture candidate prototype(s)



Conclusions

- The **total burden of chemicals harm people and the planet**
 - Vulnerable children, workers, communities, ecosystems most affected,
 - Focus on *accumulation of effects and of chemicals*, e.g. persistent PFAS
- **Risk assessment cannot keep up with increasing diversity of chemicals**
- Difficult to foresee future exposures in a circular economy and climate change => **extra precaution needed to ensure clean material cycles**
- EU chemicals strategy for sustainability calls for **additional risk governance tools** to achieve **upstream prevention of pollution**:
 - *Avoiding non-essential uses of chemicals of concern*
 - *Managing chemical groups – e.g. PFAS and microplastics as a class*
 - *Applying Mixture Allocation Factors (MAF) across regulations*
 - *Transition to Safe and Sustainable by Design (SSBD) chemicals & products*



Thanks for listening!

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