

Occurrence of substances of concern in Baltic Sea Region buildings, construction materials and sites

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8th of April 2025, Vienna

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What we know?

- Hazardous substances (HS) are used in construction materials
- NonHazCity 3 literature analysis: a high diversity of chemicals of concern in building materials.
- Findings in ”**Building materials catalogue** for tox-free construction” (available at <https://thinkbefore.eu/>)
- HS are emitted from construction materials into the environment and indoor space causing exposure and detrimental effects. ([link](#)) ([link](#))
- Study finds 55 chemicals of high concern used in building materials identified as the most relevant in exposure modelling (Huang et al 2021). ([link](#))
- Human exposure through dust, air, skin absorption ([link](#))

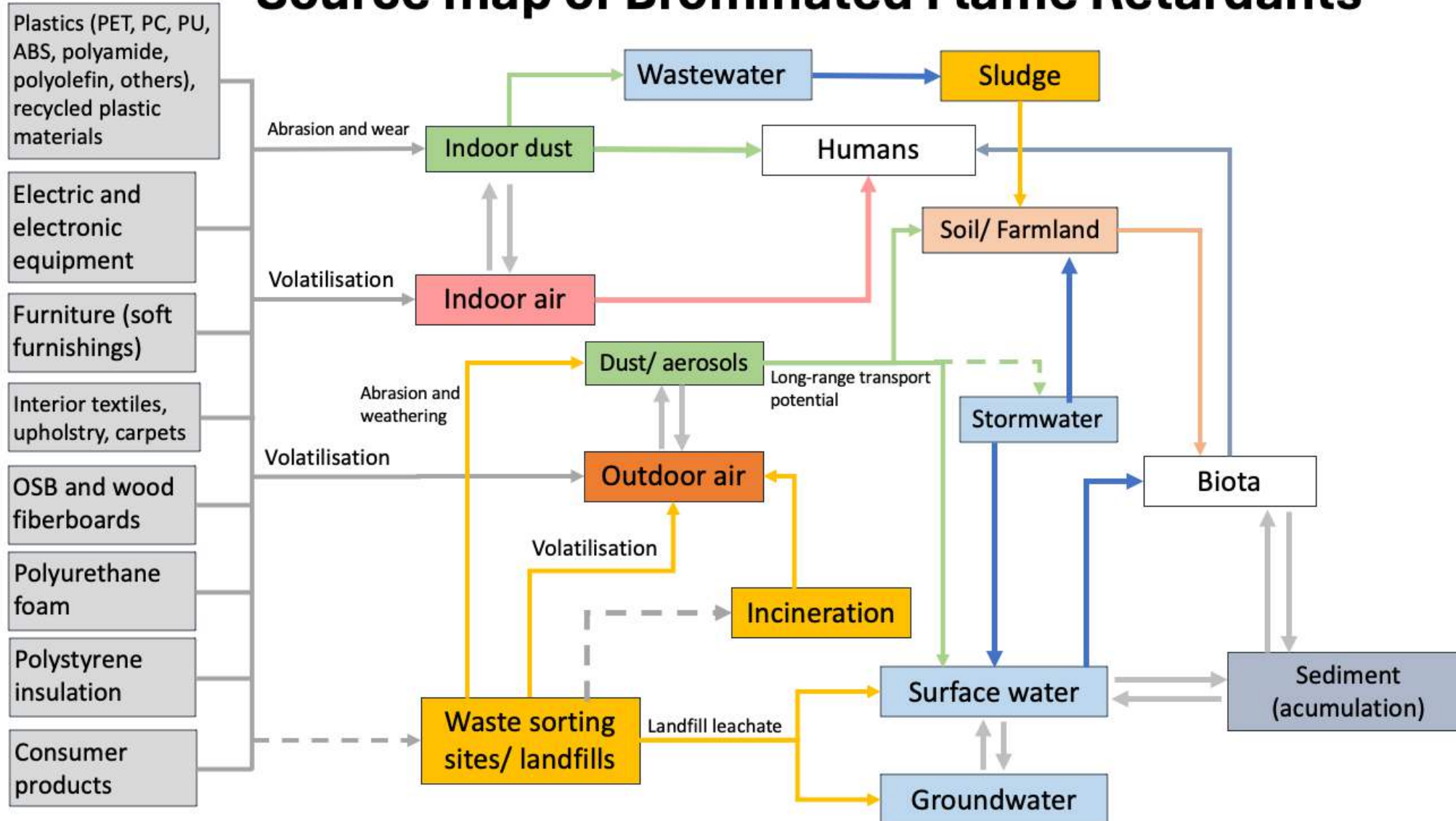
Main hazardous substances (HS) issues in construction materials

- Regretable substitution cases (e.g. Bisphenol A (BPA) to BPS)
- Some materials containing HS are used in very high volumes (e.g. insulation foam with FR additives (HBCDD, TCEP, TCPP, TPP))
- In others, high concentrations of HS are present (e.g.: PVC softeners (up to 30% w/w))
- Legacy pollution
- "Emerging" new substances (e.g. DINCH, bisphenols, alternative PFAS)
- Some chemicals ubiquitous in the environment (PFAS, BDEs, OPEs)



Source mapping exercise

Source map of Brominated Flame Retardants

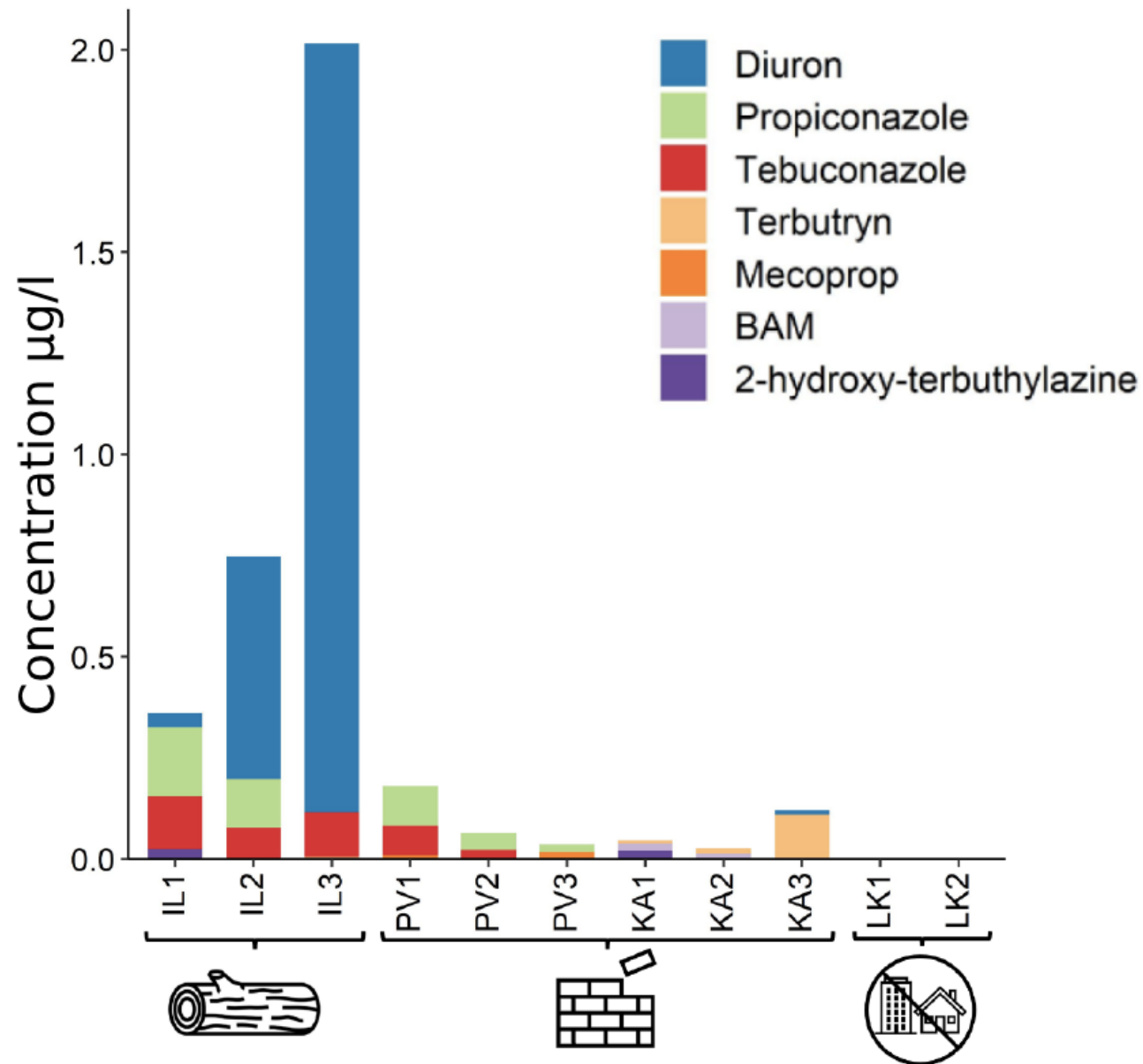


Most important findings from NonHazCity 3 screening

- Biocides in storm water from areas with wooden construction in Turku
- Biocides present in paint for outdoor use (after curing) (lab analysis Stockholm)
- PFAS in preschool dust in Västerås (possible source –flooring surface treatment)
- Not all HS is declared in construction material product information.
- Floor renovation/ removal (PVC) decrease HS in dust
- Regulation of substances cause reduction indoors/ in the environment. (e.g. DEHP)
- We are exposed to cocktail of chemicals in the indoor spaces.
- Leaching from building surfaces can lead to exceeding of environmental quality standards applicable to surface water (Diuron)



Biocides in stormwater in Turku



- Diuron – carcinogen, under evaluation as ED. Restricted (REACH annex XVII).
- Propiconazole, tebuconazole – reproductive toxicity
- All – highly toxic to aquatic life with long lasting effects

DEHP in sewage water in Stockholm

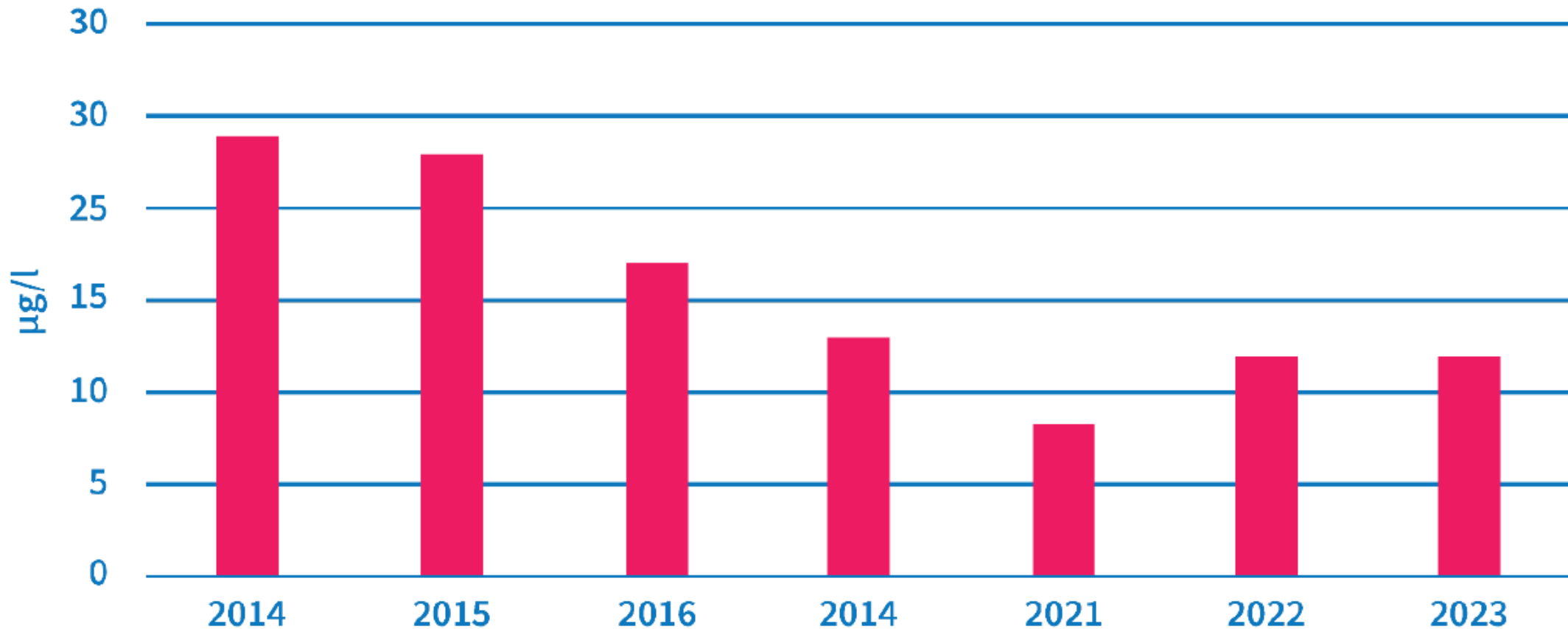
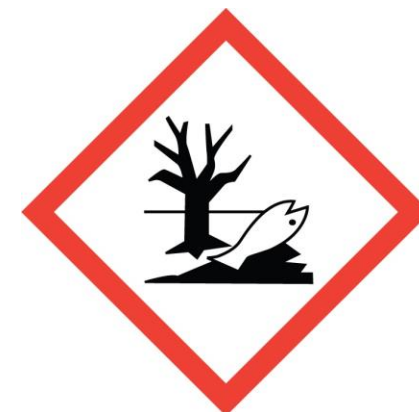


Figure 22. The concentration of DEHP in residential area wastewater from a residential area in Stockholm, Skarpnäck 2014-2023.

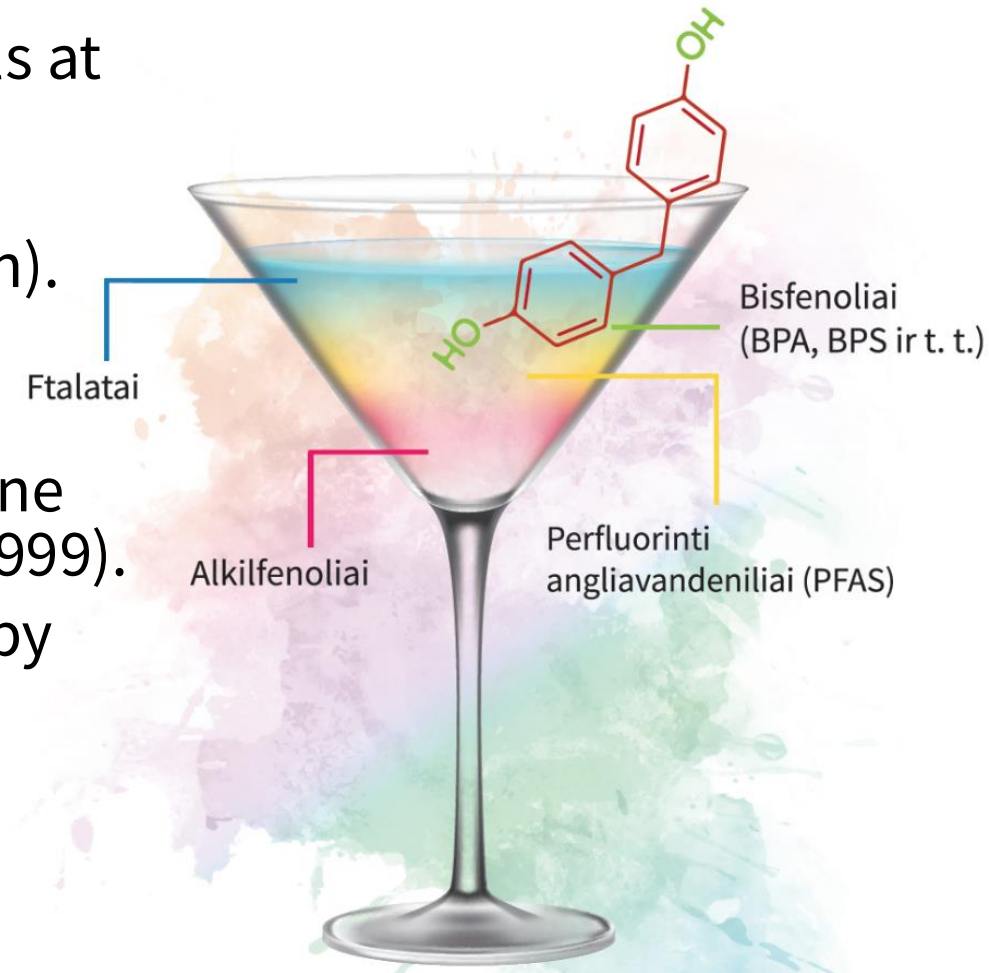
Are we affected?

- Several hundred thousands chemicals used worldwide ([link](#)). Estimations vary.
- A significant proportion have hazardous properties.
- 6,000 account for 99% of commercial importance
- (US EPA TSCA Inventory, 2024)
- Of the 16,000 plastics-related chemical substances 4,200 are of concern due to PBT/PMT properties.
- 85% of them are not regulated.
- 2/3 do not have accurate information about the hazard. (Plast-chem report, 2024).



Chemical cocktail effect

- We are exposed to a mixture of different chemicals at once.
- Usually, the effects of individual substances are investigated in scientific trials (not in combination).
- We do not know the mixture effects (synergistic/antagonistic effects)
- There is no threshold limit with regards to hormone mimicking chemical substances (Sheehan et al, 1999).
- But threshold assumption is still not abandoned by regulators
- Additive effects can and should be the basis for restriction (precautionary principle)



Recent study of the cocktail effect

- Blood test of 624 volunteers in Germany
- 294 chemicals from household items, hygiene and cosmetic products, pesticides identified.
- Neurotoxic effects studied.
- The cocktail of chemicals has an effect even if the threshold exposure limits of the individual substances are not exceeded.
- More information: Braun G., et al. Neurotoxic mixture effects of chemicals extracted from blood of pregnant women; Science (2024) ([link](#))



- Cost of exposure to endocrine disruptors in Europe per year estimated: €163 billion (Trasande et al, 2015; Trasande et al, 2016)

Table 4: Estimated costs incurred yearly in the EU by various lifestyle or environmental factors. See above for discussion.

Factor	Estimated cost, EU (Billion €)	Year of estimate and reference
Smoking	544	https://www.erswhitebook.org/chapters/tobacco-smoking/societal-costs-of-smoking/
Atmospheric pollution (PM _{2.5})	704	(WHO)
Endocrine disruptors*	163	2015 [240]

- Some EDCs are also present in construction materials.

Lessons from the past

- Asbestos fibre
- Heavy metals in paints
- PCBs
- PFAS, brominated FRs.
- **Future legacy pollution is being created today?**



There are better choices now

- Screening results showed that not all building materials contain chemicals.
- But finding the tox-free materials on the market is challenging.
- Tox-free materials may facilitate implementation of circular economy.
- The effort pays off and change is possible. DEHP has been found to decrease over time in European preschools, reflecting the phase-out of DEHP in the EU (Larsson et al, 2017)

Thank you!

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