



Plastic additives in consumer products and indoor dust

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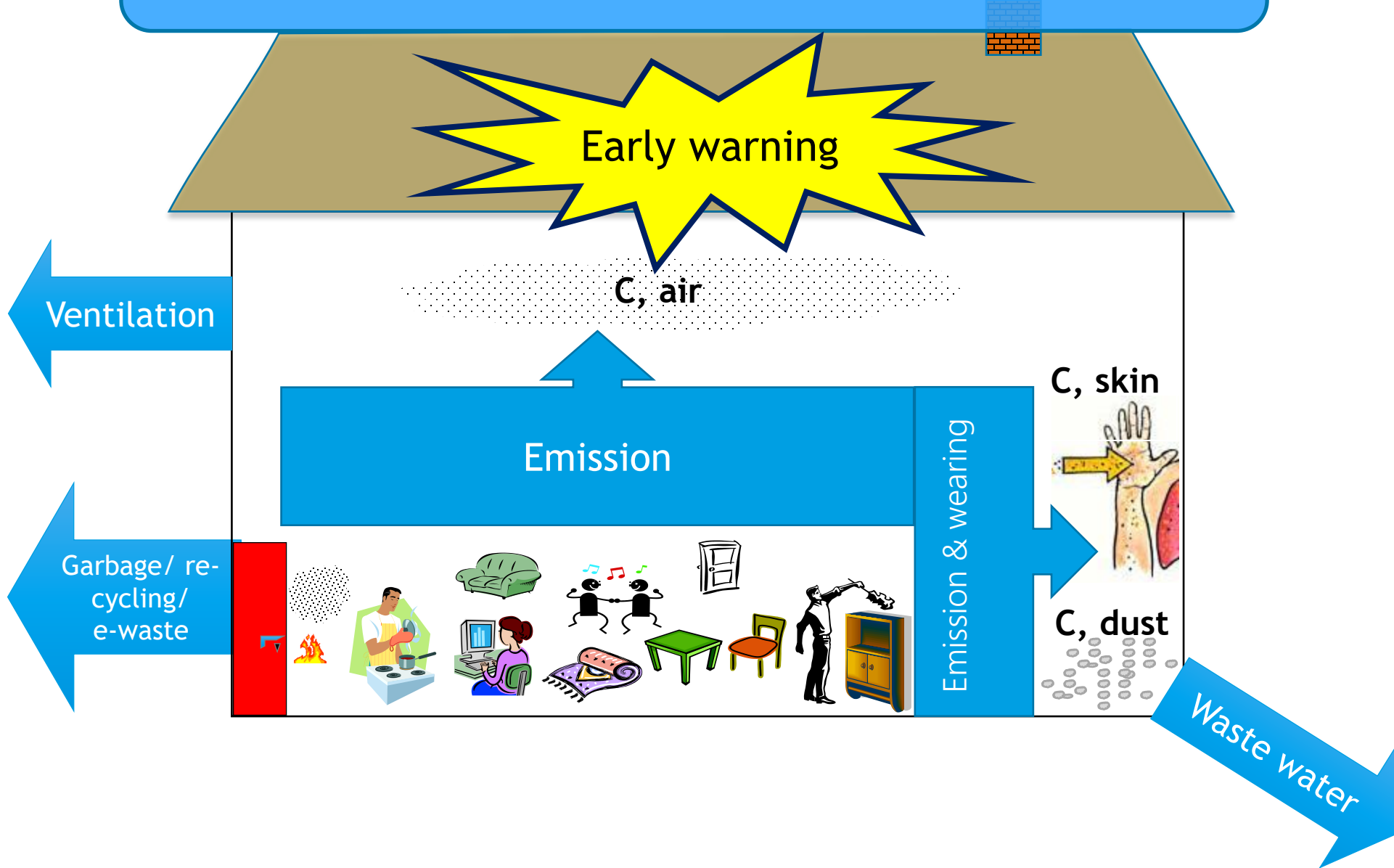
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Why?

The indoor environment acts as a source for the outdoor environment and for human exposure

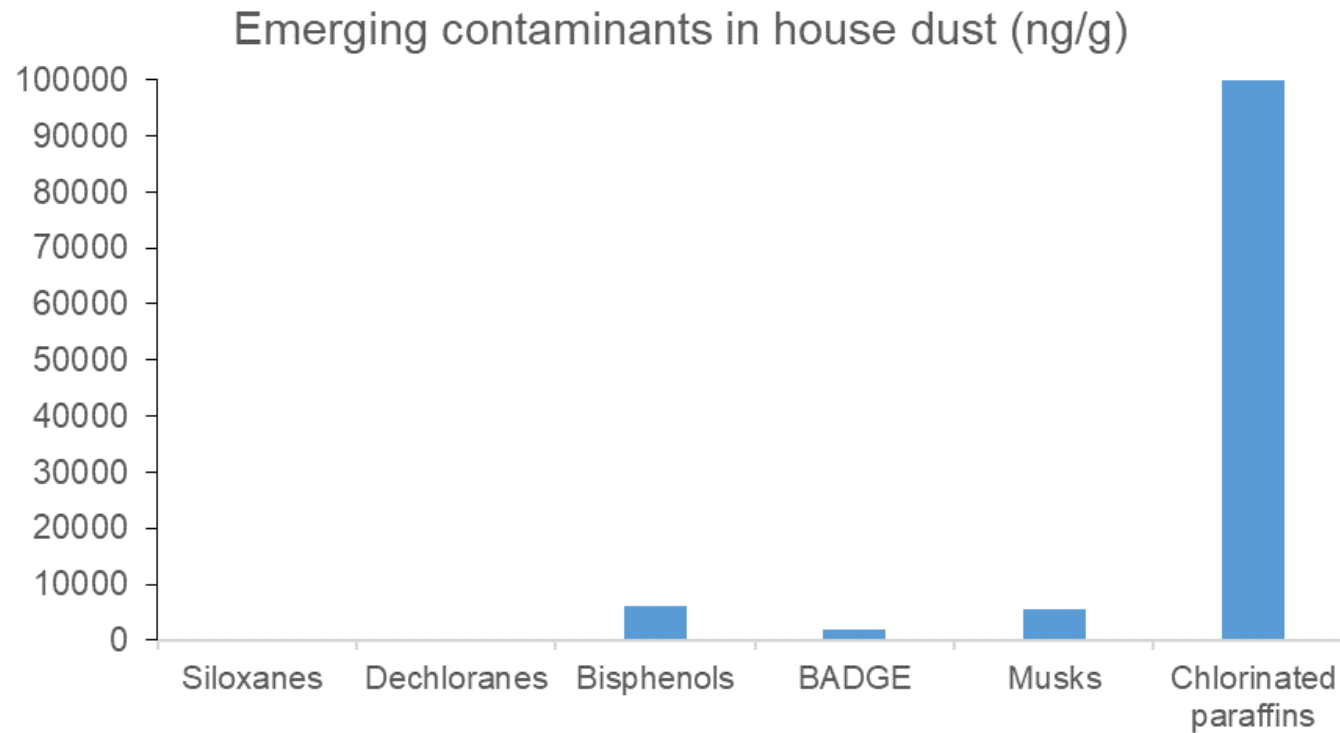


House dust – settled dust

- Indicator and proxy for long-term exposure to particles
- Easy accessible
- Non-invasive
- Vacuum cleaner or wipes
- Matrix for screening and detailed studies



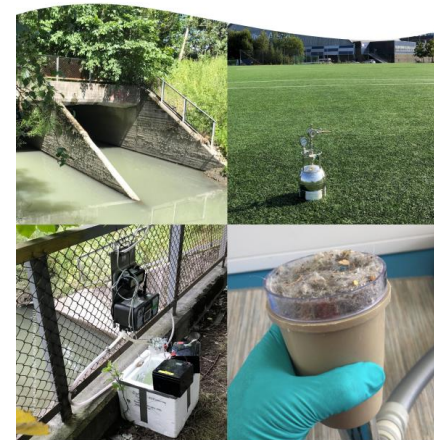
What do we find in house dust?



NVA

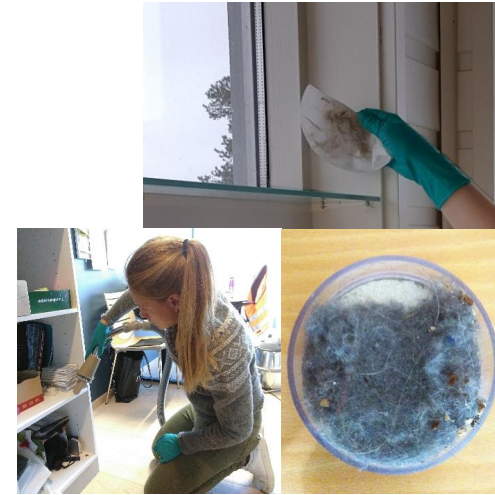
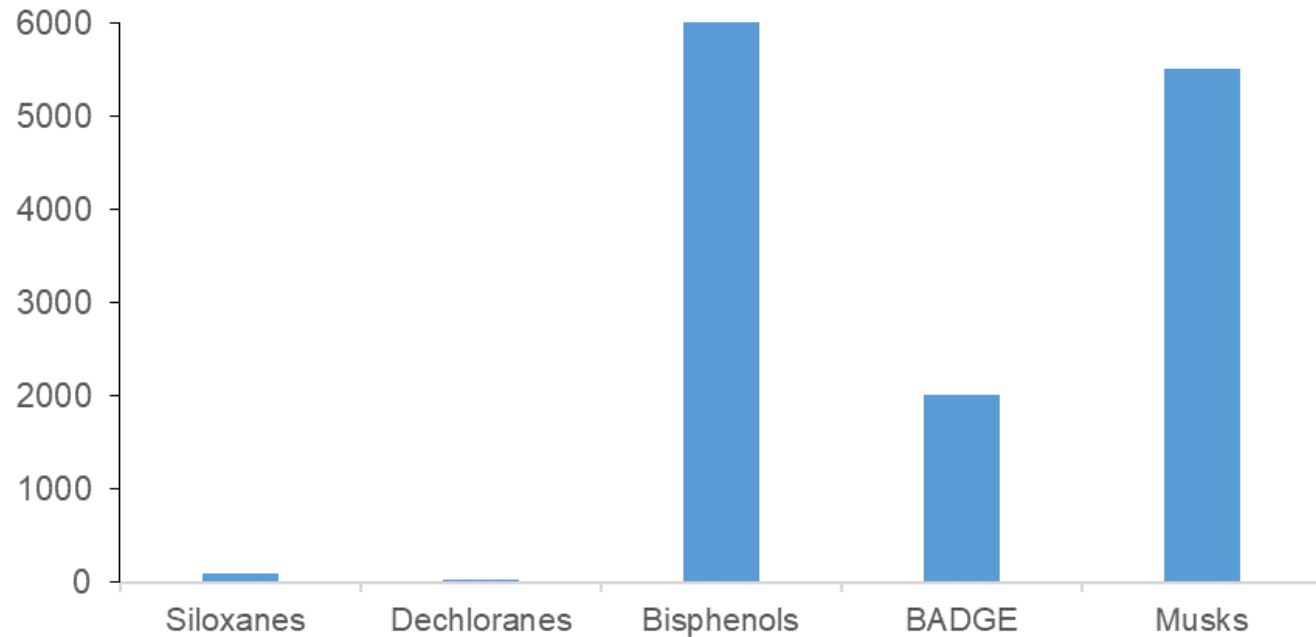
REPORT SNO.7484-2021

Screening Programme 2020, Part 1 and 2:
Plastic Additives and REACH Compounds



What do we find in house dust?

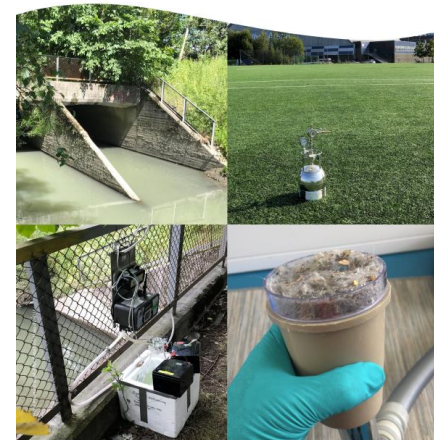
Emerging contaminants in house dust (ng/g)



NVA

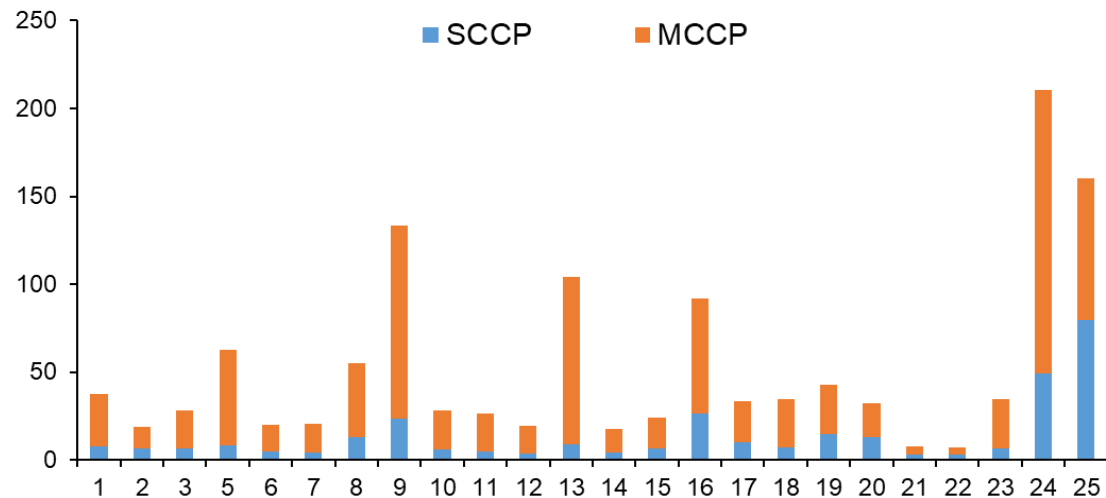
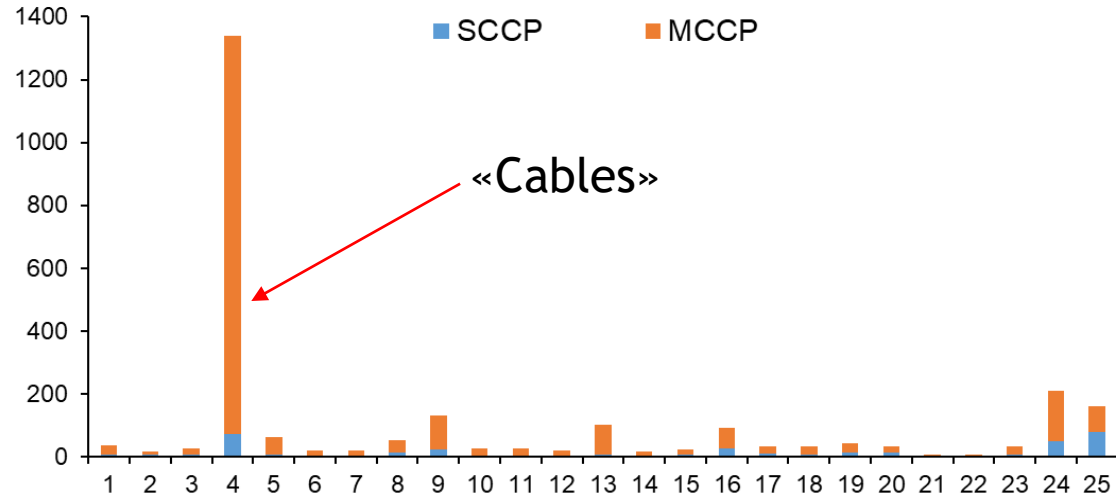
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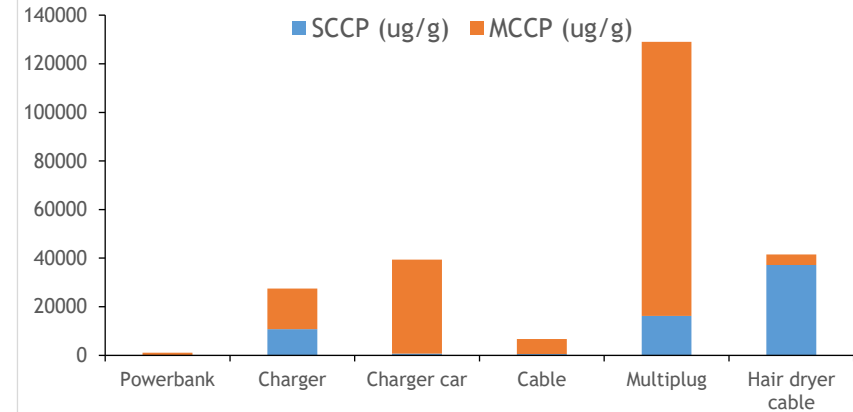


What do we find in house dust?

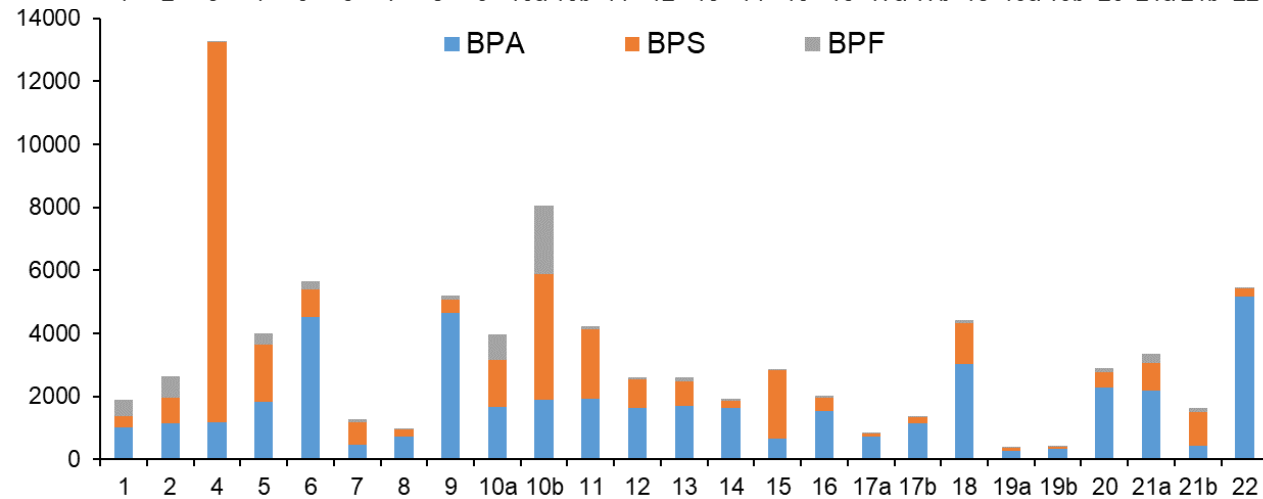
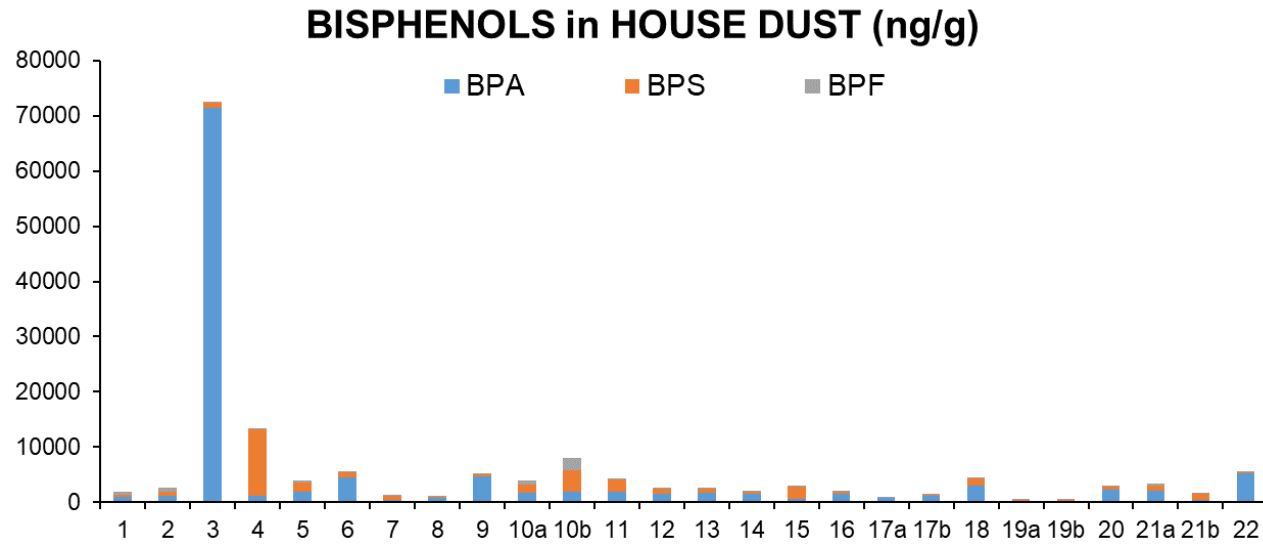
CHLORINATED PARAFFINS in HOUSE DUST ($\mu\text{g/g}$)



CHLORINATED PARAFFINS in PRODUCTS

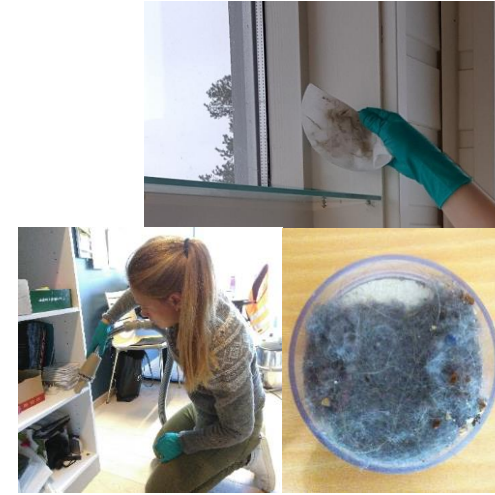


What do we find in house dust?



What do we find in house dust?

FLAME RETARDANTS in HOUSE DUST



Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

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



Small-scale spatial variability of flame retardants in indoor dust and implications for dust sampling

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What do we find in house dust?

- Most targeted compounds are detected in house dust
- High concentrations: $\mu\text{g/g}$
- Easy matrix for detection of chemical additives

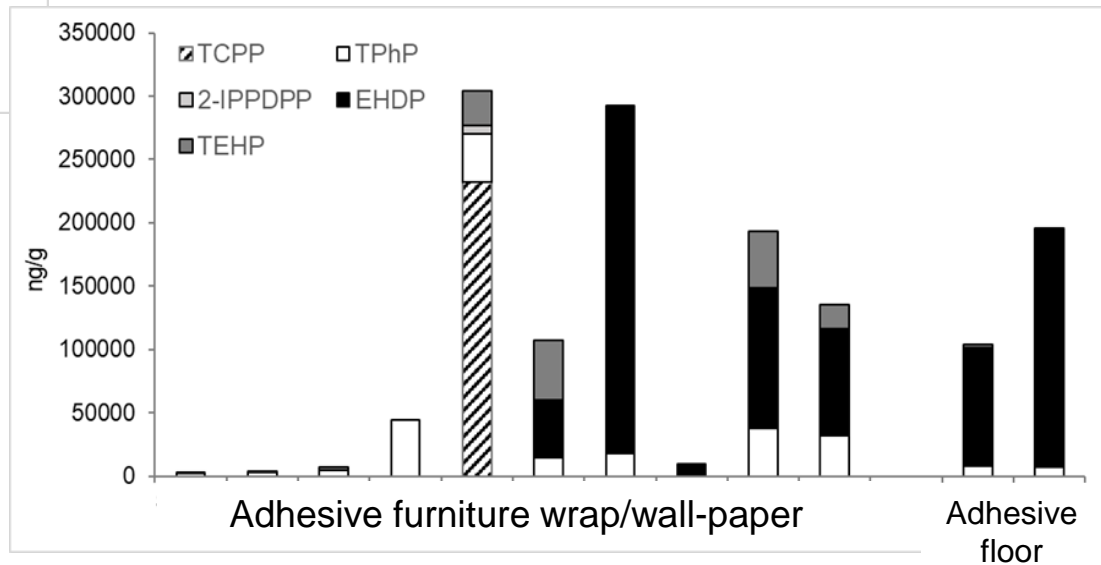
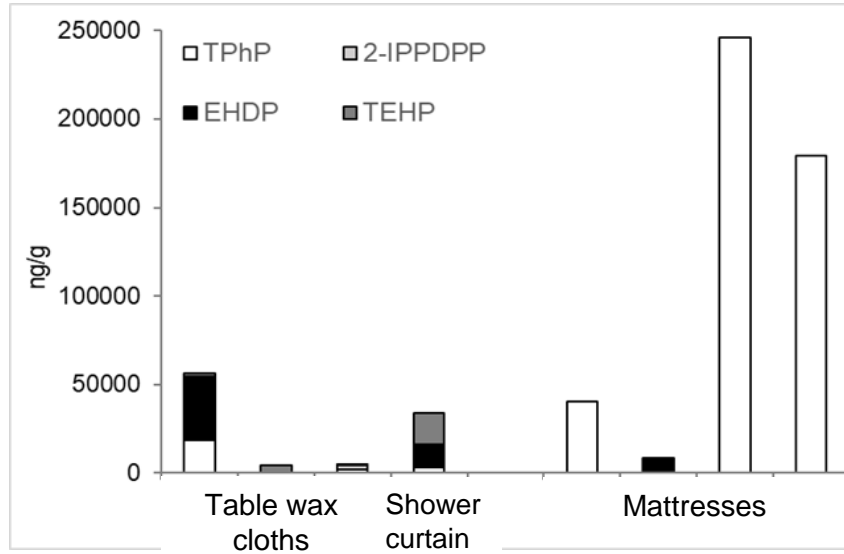
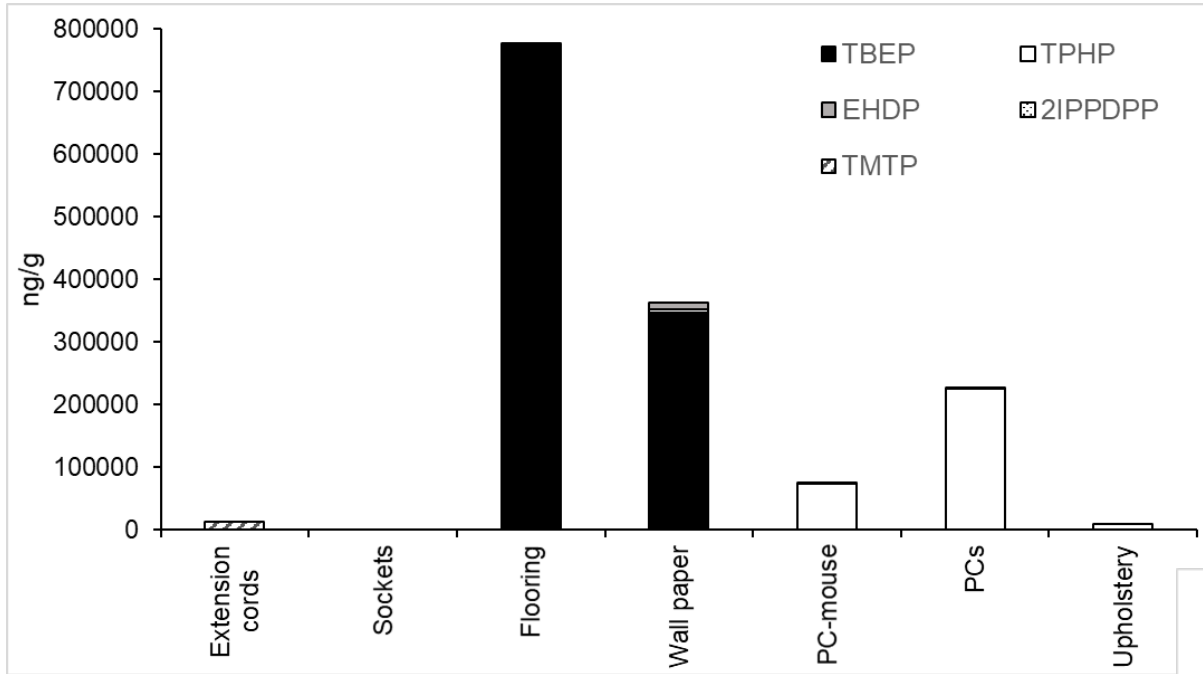


Additives in products

- Plastic products commonly used in homes
 - Electronics
 - Interior building materials
 - Consumer products
- Extractable content
- Release to surfaces
- Organophosphorous and brominated flame retardants, Chlorinated paraffins, dechloranes



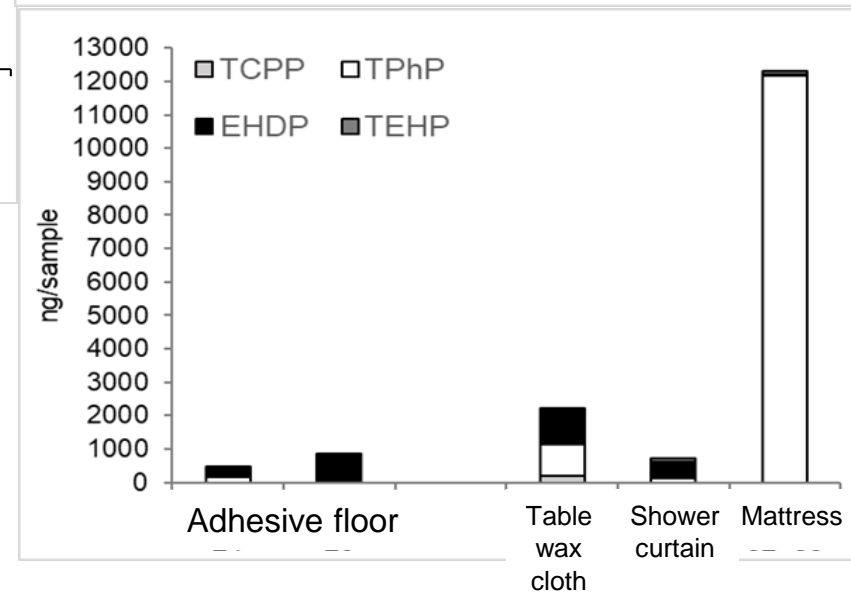
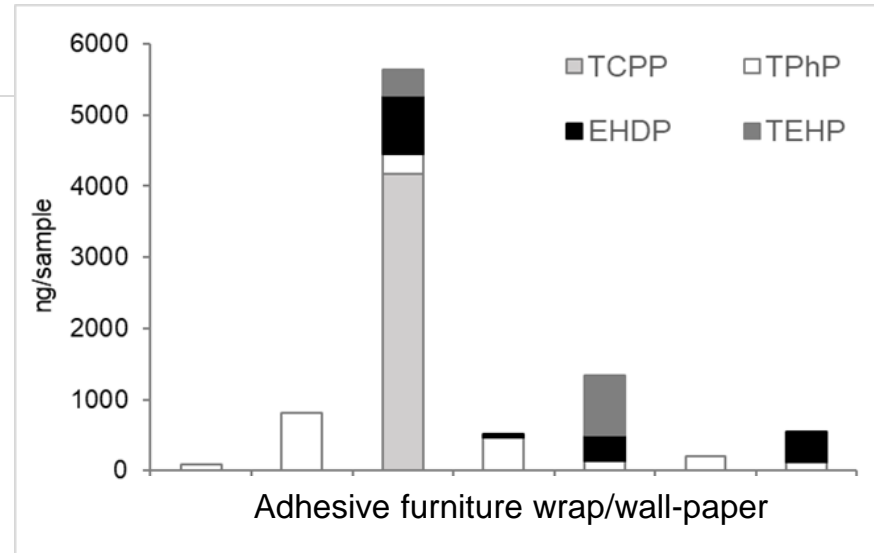
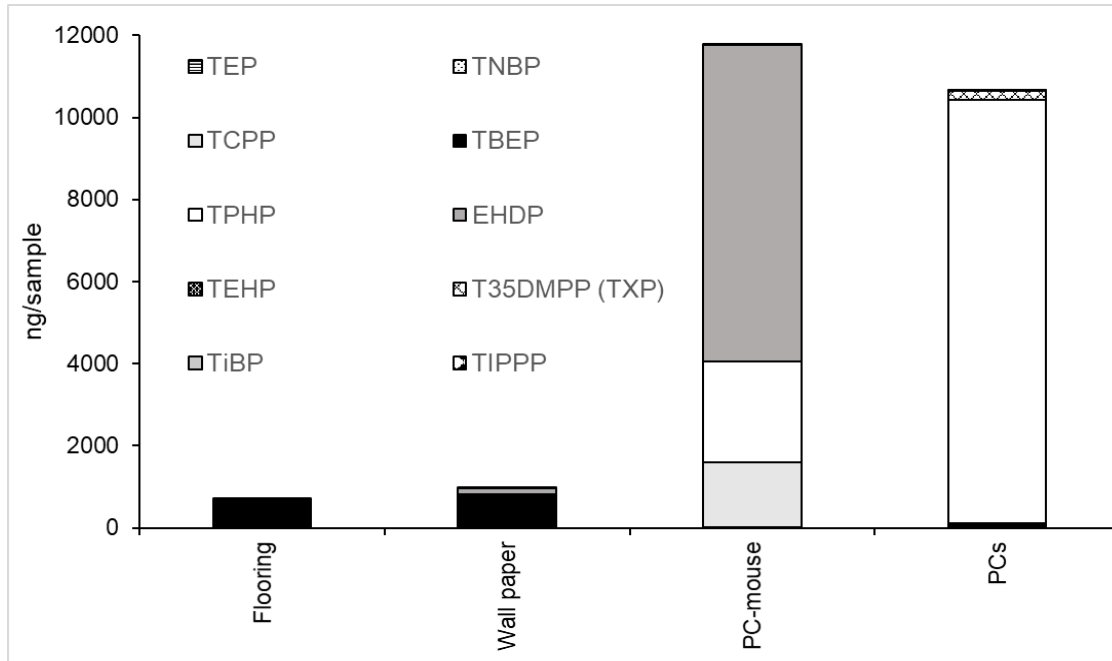
Content of OPFRs



10-800 $\mu\text{g/g}$

TBEP, TPhP, EHDP, TCPP, TEHP

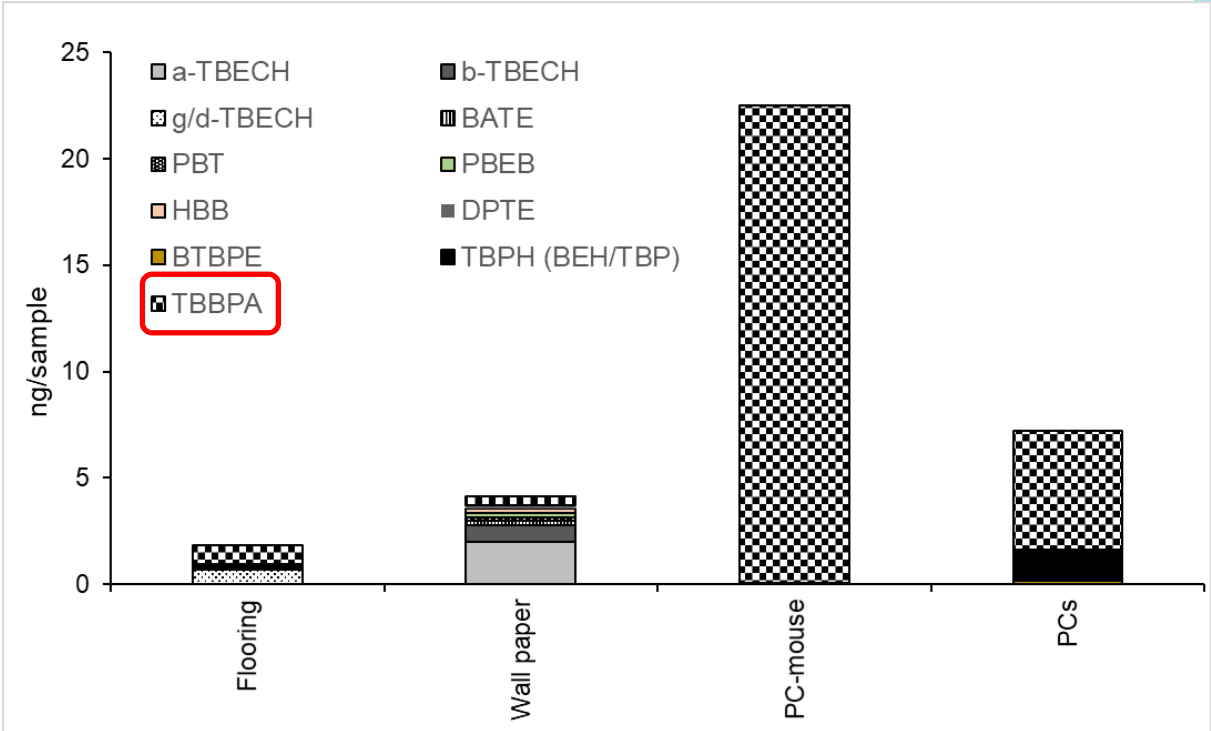
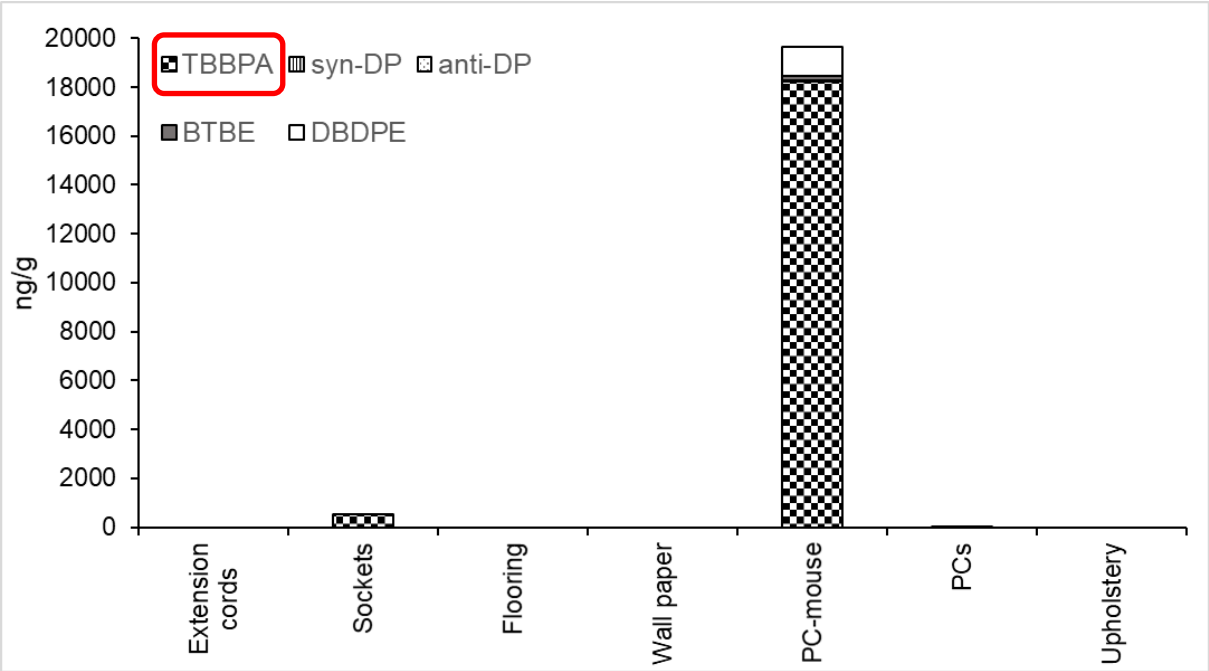
Release of OPFRs to surfaces



10-10 000 ng/sample

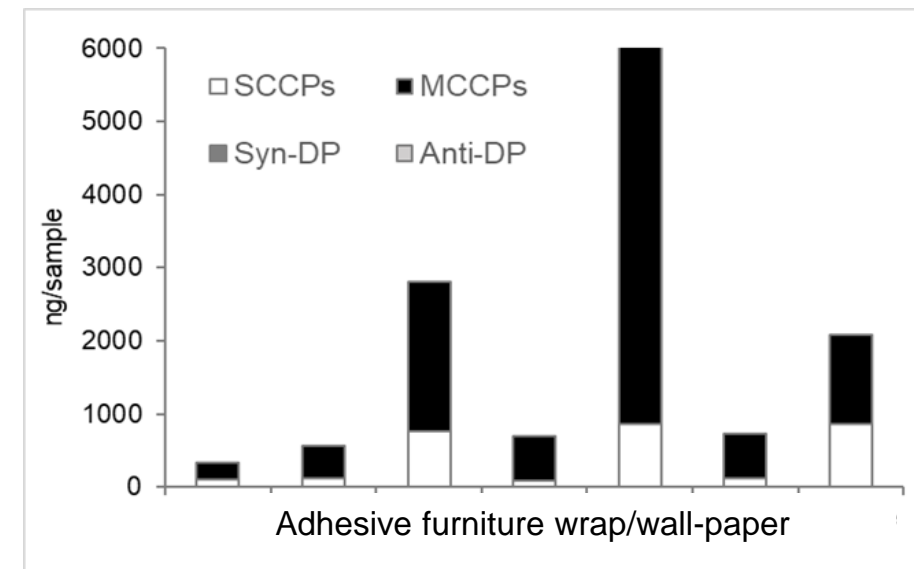
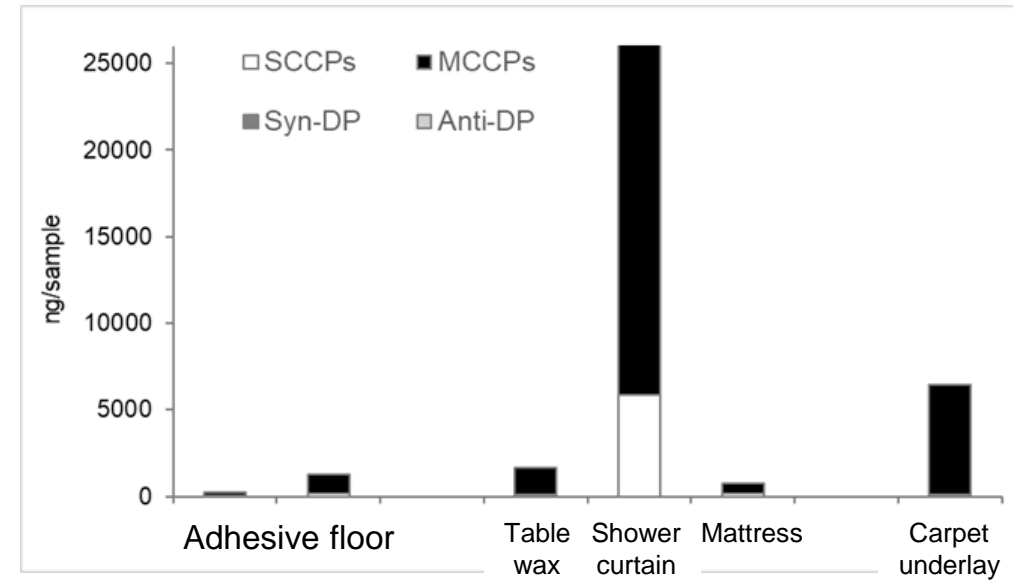
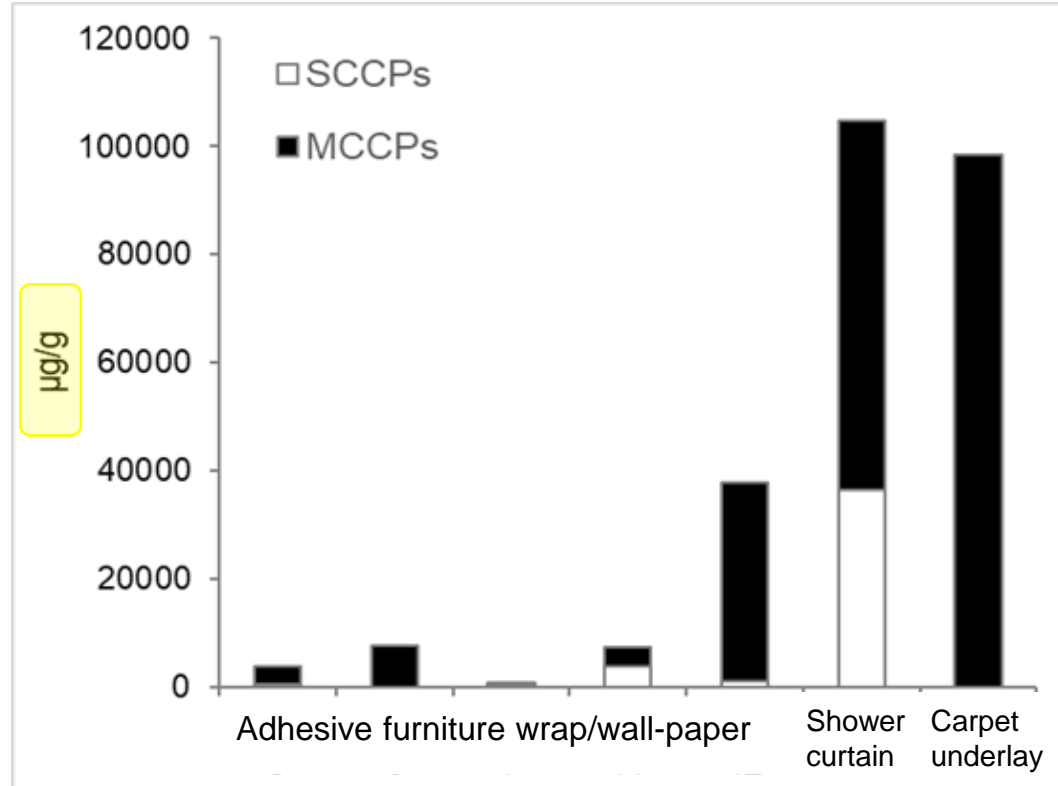
TPhP, EHDP, TCPP, TBEP, TEHP

Content and release of brominated flame retardants



Content: 100-18 000 ng/g
 Release: 1-25 ng/sample
 10-1000 times lower than OPFRs

Content and release of chlorinated paraffins



Content: % and ‰-levels - 0.1-99 mg/g
 100-1000 times higher than OPFRs
 Release: 0.1-25 µg/sample

What do we find in products?

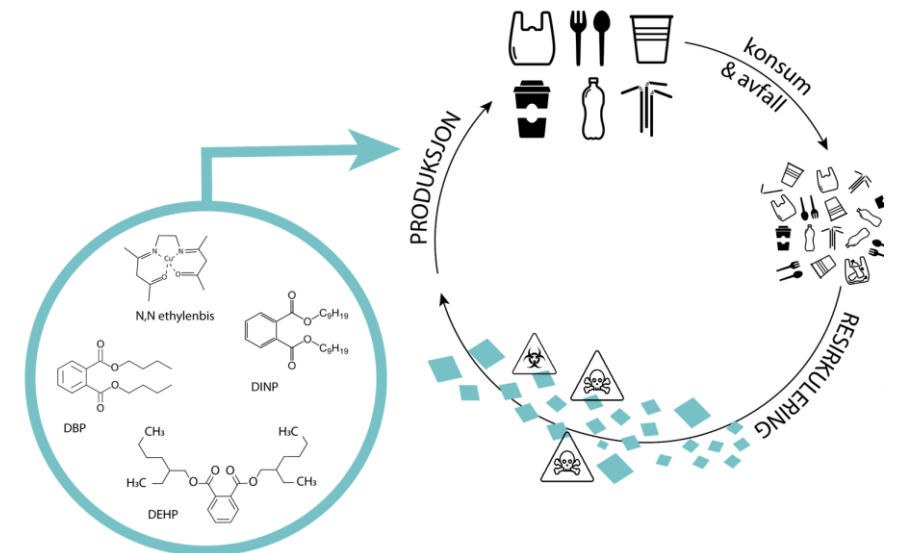
- High concentrations of OPFRs and chlorinated paraffins
- OPFRs detected in the highest number of products
- CPs detected in fewer products but at higher concentrations
- Products with PVC were found to be sources for both CPs and OPFRs
- Chemical additives migrate to the surface itself or to particles on the surface of the products and particles settled on the walls of a sampling container



PlastCycle: NFR research project at NILU

Optimizing resource efficiency while minimizing recycling of hazardous chemicals in a circular economy.

- Mapping the stocks and flows of **7 plastic polymers** in Norway
- Identifying **chemicals of concern (CoC)** in plastic polymers for different application
- Defining scenarios to reduce plastic consumption and waste
- Suggesting **policy interventions** and **circular strategies** for reducing plastic production, consumption and waste generation



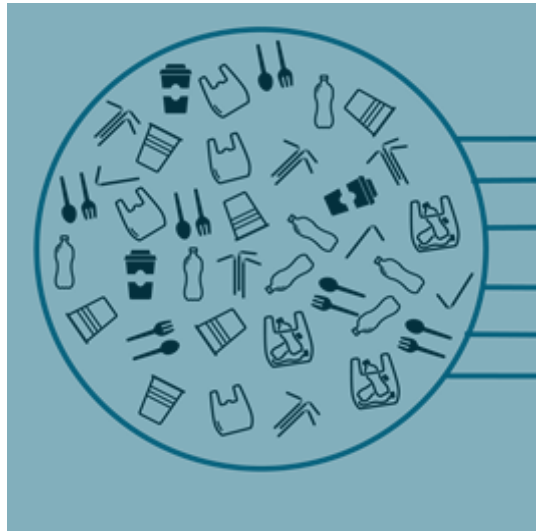
Approach

Industrial sectors

- PET
- PVC
- EPS
- PP
- PS
- LDPE
- HDPE

- Packaging
- Construction
- Agriculture
- Automotive
- EEE
- Boat
- Clothing and textile
- Other plastic

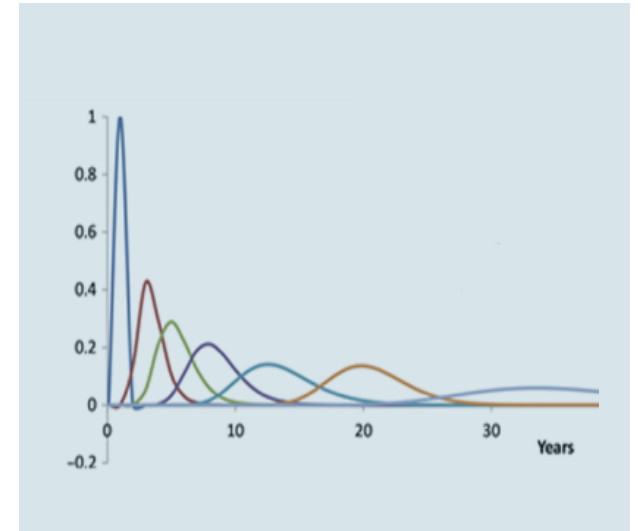
Product categories



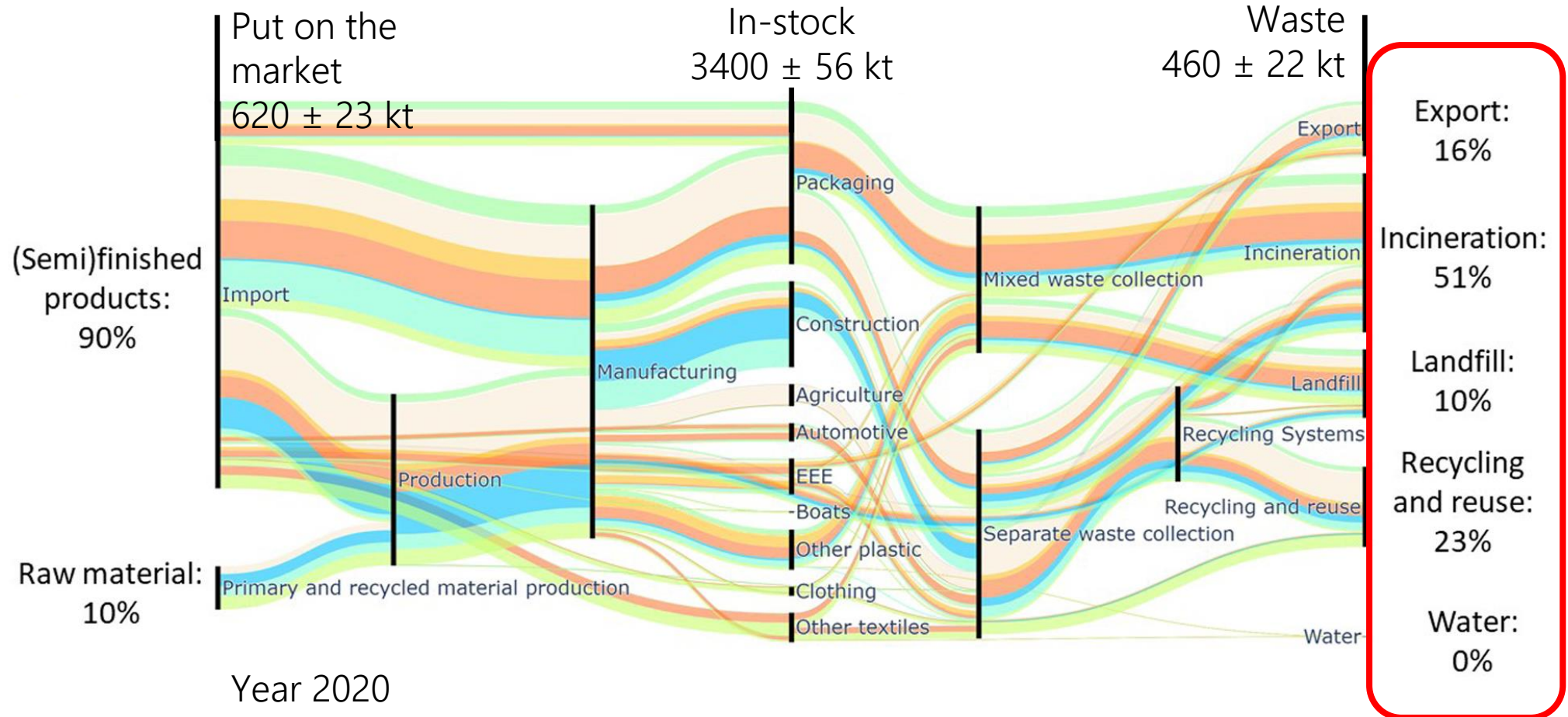
Polymer fraction

- PP
- PS
- PET
- PE
- HDPE
- LDPE

Life span distribution

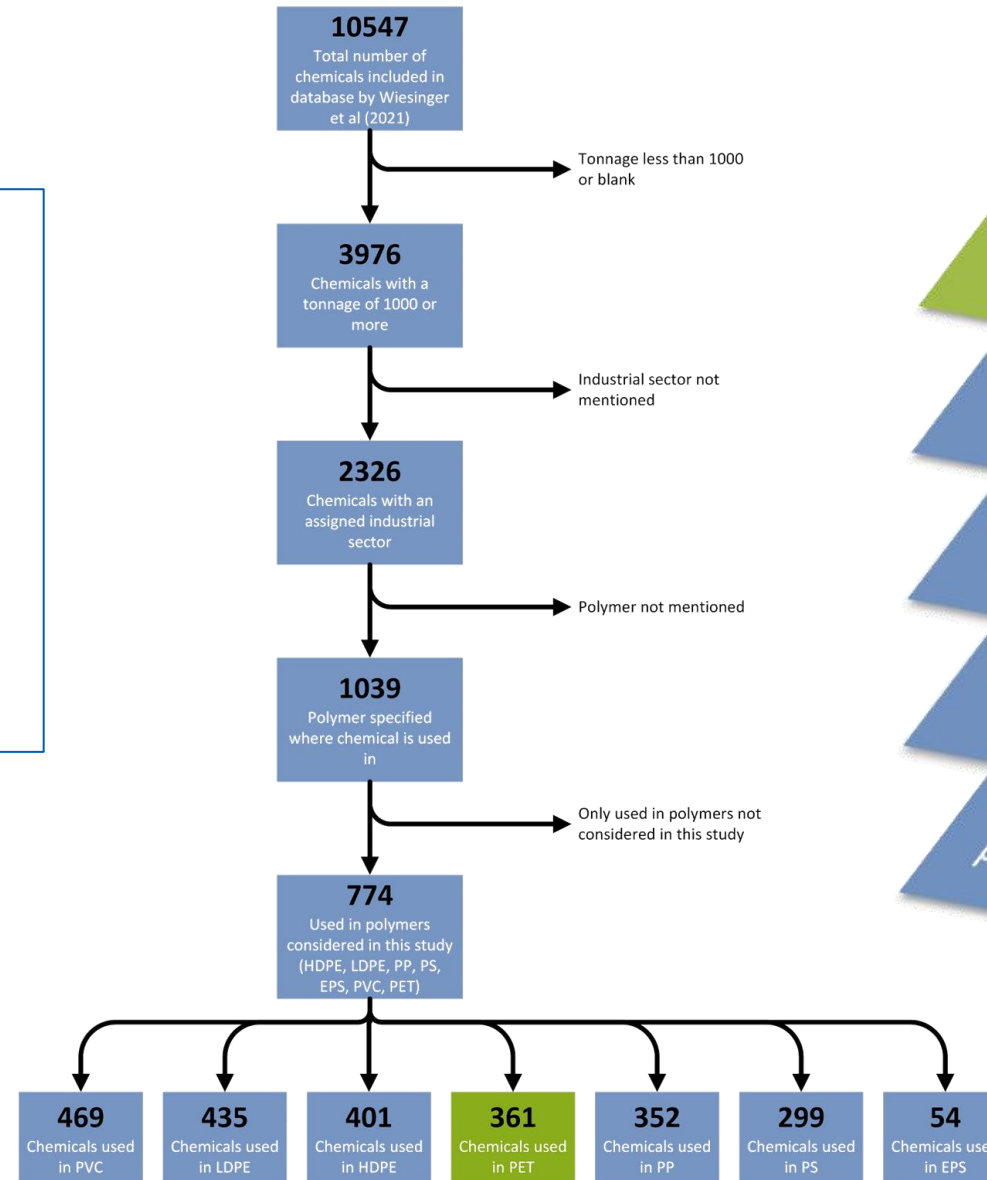
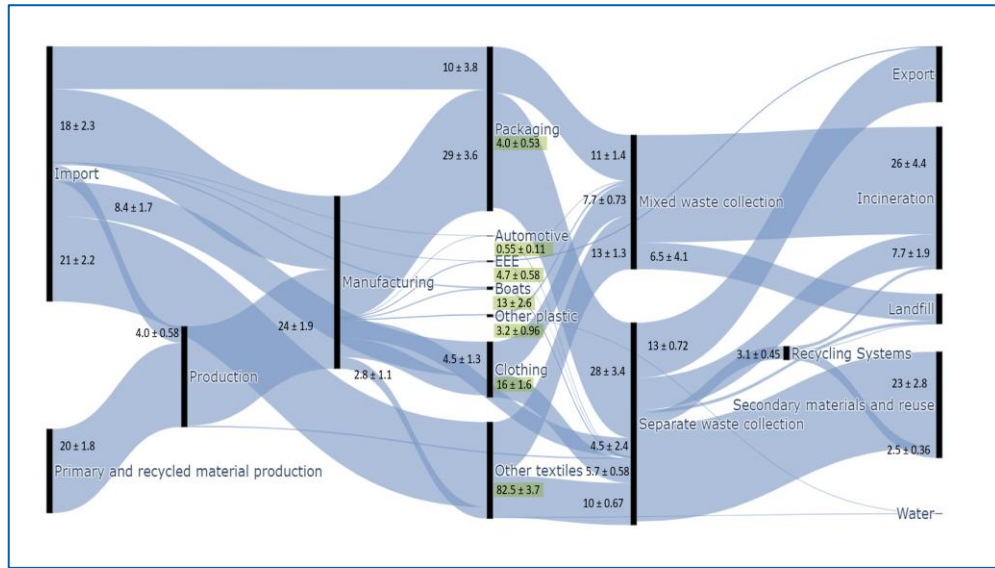


- PET
- PVC
- EPS
- PP
- PS
- LDPE
- HDPE



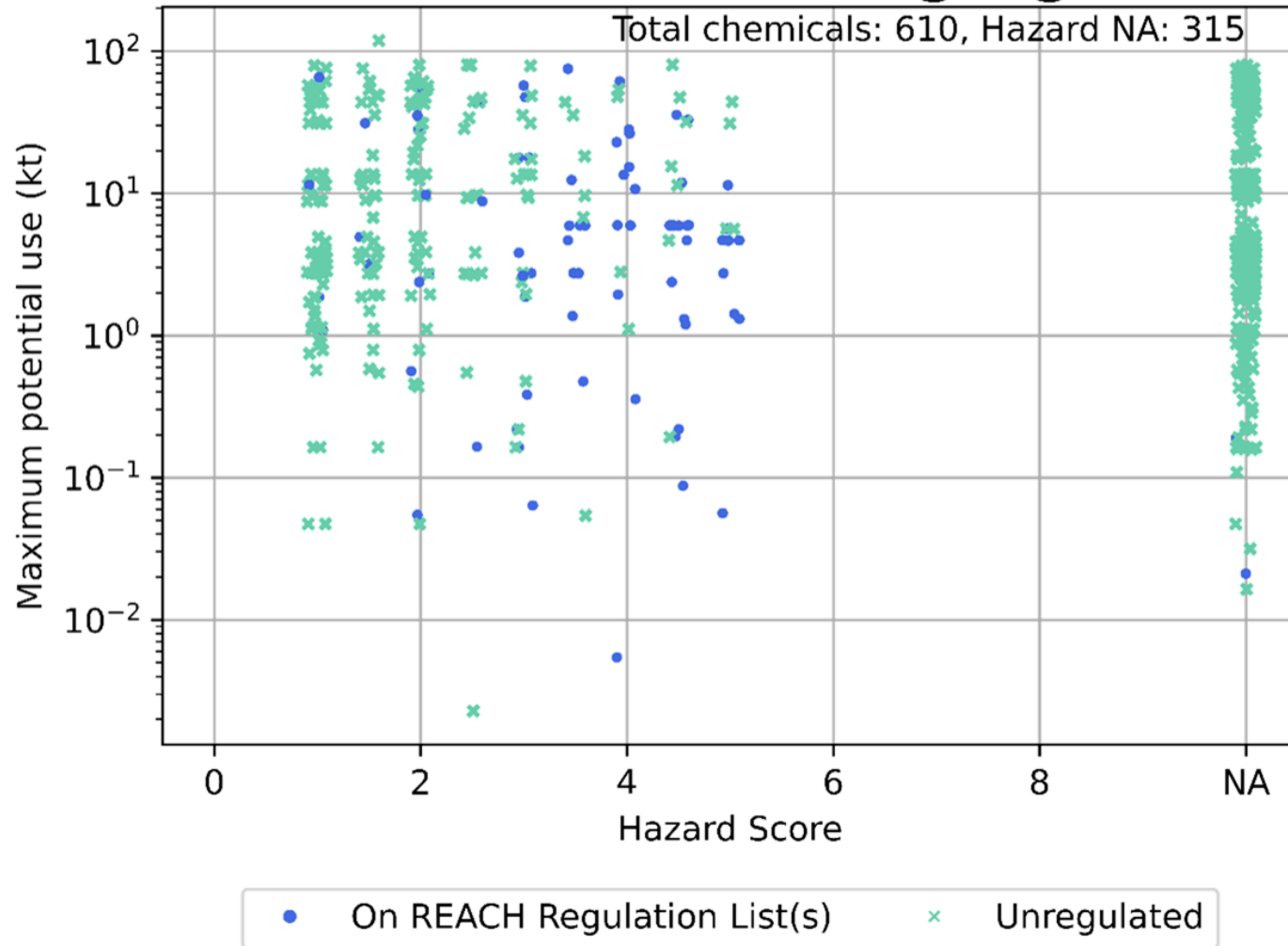
Identifying chemicals of concern (CoC)

Screening of database with 10,547 intentionally added chemicals to plastic



- 361 chemicals in PET
- Application (packaging)
- Chemical function (98 plasticizers)
- Ranking by total amount (kt)
- Further prioritization

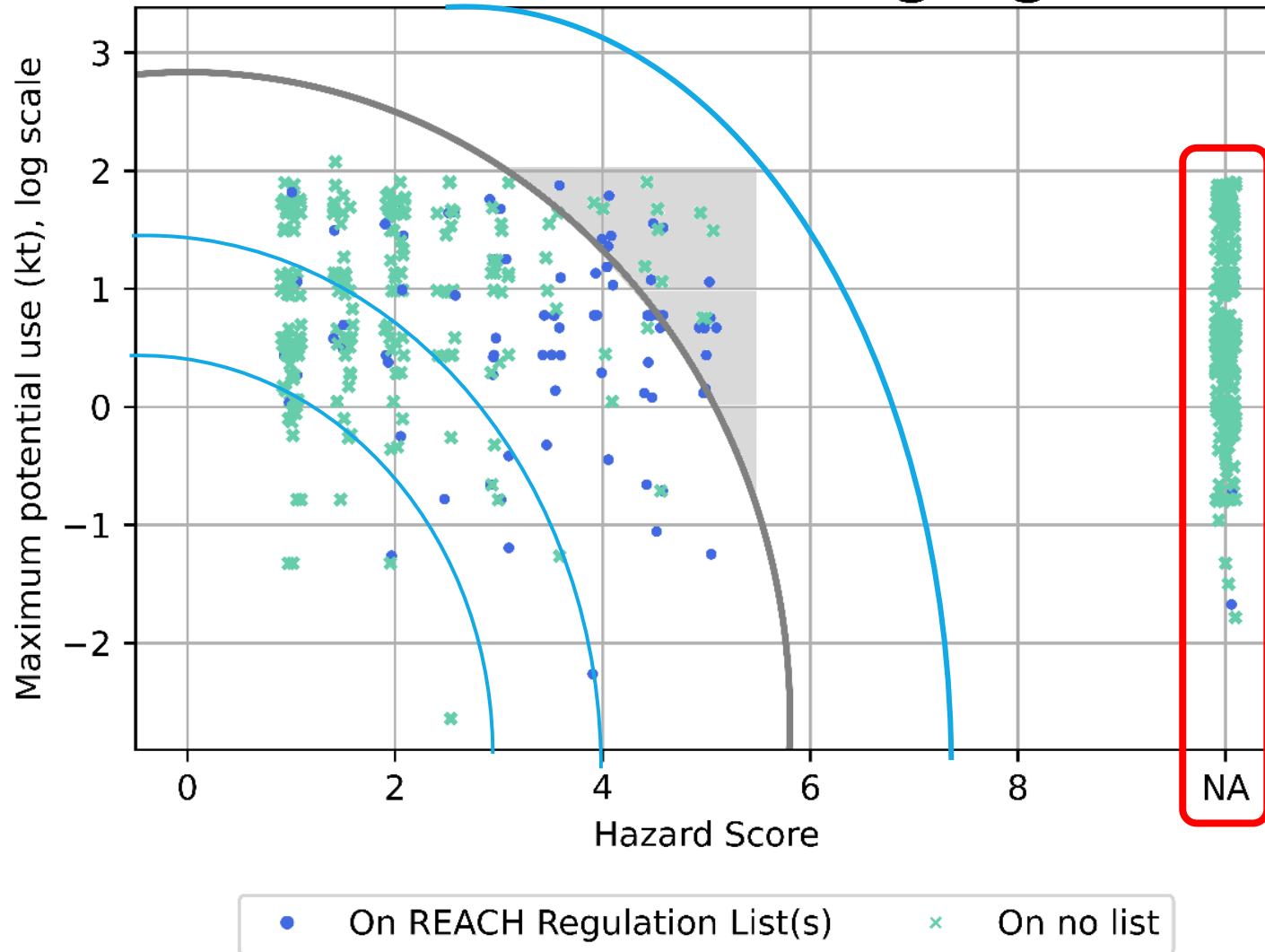
Hazard: Packaging



Hazard score: from 0 (no criteria fulfilled) to 8 (all criteria fulfilled):

- Persistent
 - Bioaccumulative
 - Aquatic toxicity
 - Specific target organ toxicity repeated exposure
 - Carcinogenic
 - Mutagenic
 - Reprotoxic
 - Endocrine disrupting
- 88 out of 610 chemicals are already regulated by REACH (14%)
 - Hazard score available for 295 chemicals (48%)

Hazard: Packaging



- 27 chemicals in outermost circle:
 - Most concerning
 - 16 regulated by reach
 - 11 unregulated
- Hazard score 4 enough for concern?
 - 100 unregulated
- Half of the chemicals are without hazard score



Thanks for the attention!

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