Merete Grung[1], Sissel Ranneklev[1], Eirik Hovland Steindal[1], Sondre Meland[1], Karina Petersen[1],

[1] NIVA—Norwegian Institute for Water Research, Oslo, Norway

PFAS in chemicals in Norway 2009-2017

Background

Norway has a history of excellent data registers for a multitude of purposes, and has since 1981 had an official register of chemicals imported and produced in Norway. According to Norwegian legislation, manufacturers or importers who produce and/or place on the market 100 kg/y or more of a chemical classified as hazardous are obliged to submit a declaration to the Product Register (PR). When the declaration is submitted, the full composition of the chemical product must be stated. All CAS registry numbers (CASrn), their amount, use and product category is registered in PR. The PR is therefore a very useful tool for gathering information about usage of hazardous substances.

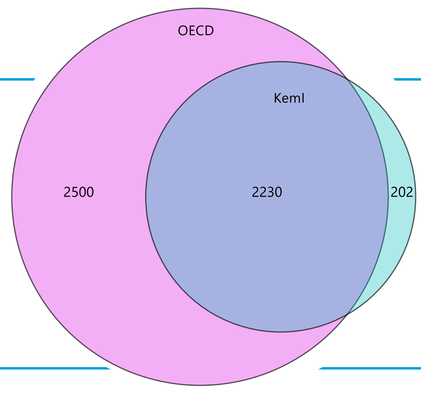
The aim of this study was to identify the PFASs in chemicals used in Norway during 2009-2017, their amounts, product category and time trends. Whenever possible, we also wanted to study the effect of regulation of PFASs, and the potential for environmental hazard.

Approach

The PR data for the period 2009-2017 was searched for CASrn with perfluorinated substances. An extensive list of PFAS substances (n=4,730) has been gathered by OECD[1]. In addition to the OECD list, the CASrn from KemI[2] that were not included in the OECD list were added to the CASrn of interest. A total of 202 CASrn was listed by KemI, but not OECD and are here denoted as KemI-listed PFAS. Information was collected—i.e. the tonnage/y of PFAS used, which products they were used in and branch of industry that utilised the PFAS.

1 OECD (2018) http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=ENV-JM-MONO(2018)7&doclanguage=en

2 KEMI - Swedish Chemicals Agency (2015). Occurrence and use of highly fluorinated substances and alternatives, Report 7/15.



Results

PFAS use (2009-2017): The total amount of PFAS used in chemicals and mixtures was **249 tons**, with an average use of 28 tons/y. A total of **77 CASrn** with fluorotelomers constituting the structure category PFAS with highest use during the period (Fig. 1). Use of fluoropolymers, short chain fluoro-compounds (KemI-listed PFAS) and precursors to perfluoroalkyl acids (PFAA) were also substantial, while use of sulfonyl fluoro-compounds was 1.3 tons.

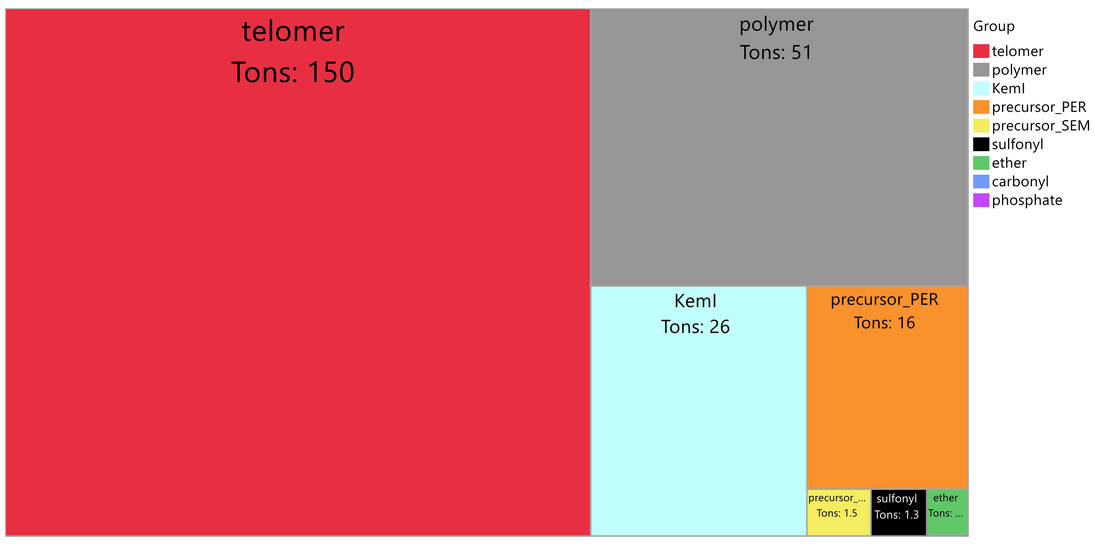


Figure 1 Treemap of amount (tons) of PFAS structure categories used in Norway (2009-2017).

What were PFAS used for: The product categories utilising PFAS compounds were quite diverse (Fig.2), with fire extinguishing at the top (140 tons). The use of different product categories was linked to PFAS structure categories indicated in Fig. 3.

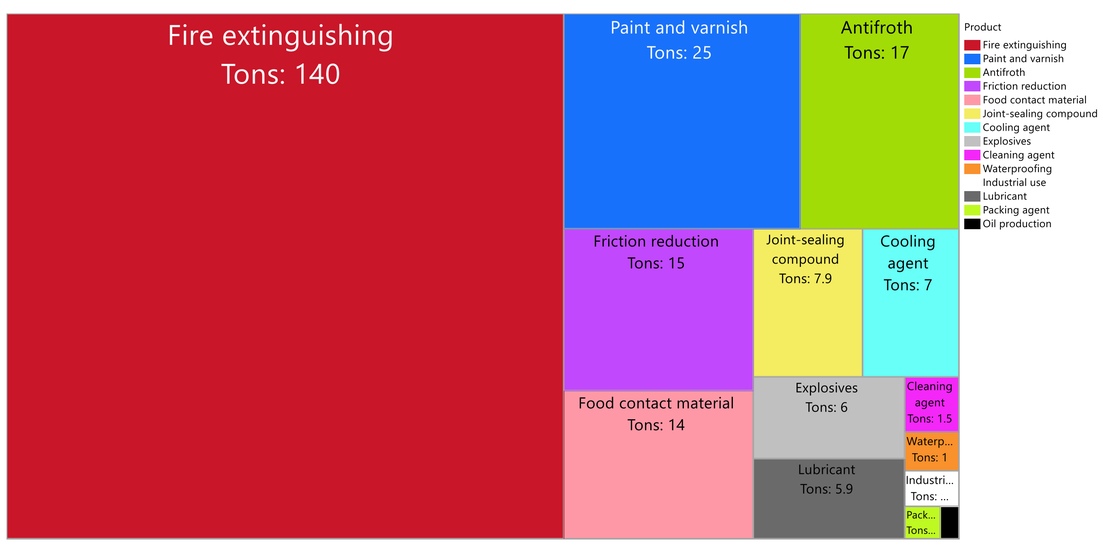


Figure 2 Treemap of PFAS use (2009-2017). Only product categories with >200 kg PFAS used are included.

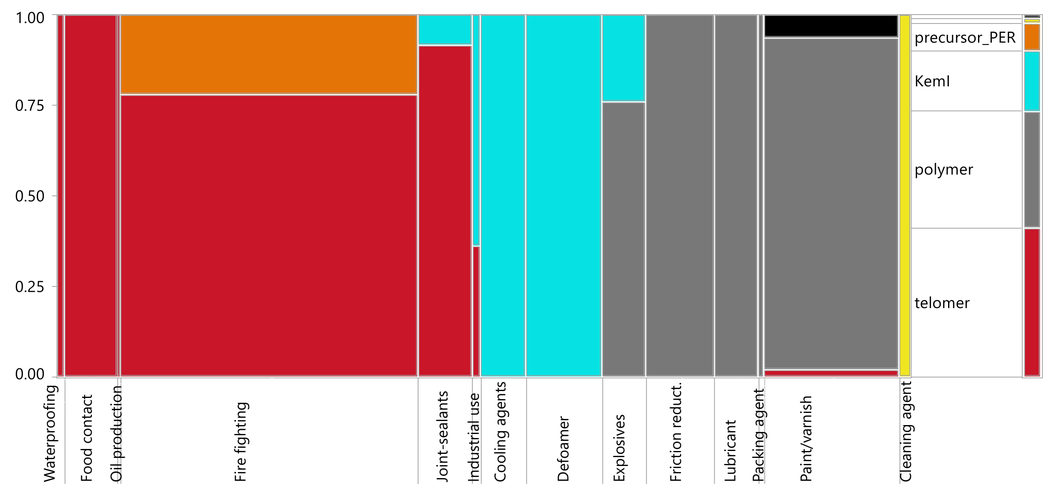


Figure 3 Mosaic plot of product categories vs. structure categories of PFAS used in the products. Only product categories with amounts >200 kg/year are included. The amount (log+1) was used to weigh the data. The same colour scheme as in Fig. 1 are used. To the far right the mean of PFAS structure categories overall is indicated.

Temporal trends: During the period, a clear temporal trend could be observed with reduced use of PFAS telomers (associated to use as fire extinguishers) after 2014, and increased use of fluoropolymers, short chain fluoro-compounds and precursors to PFAA. This coincided with a use of PFASs in products that previously had not used fluorinated compounds.

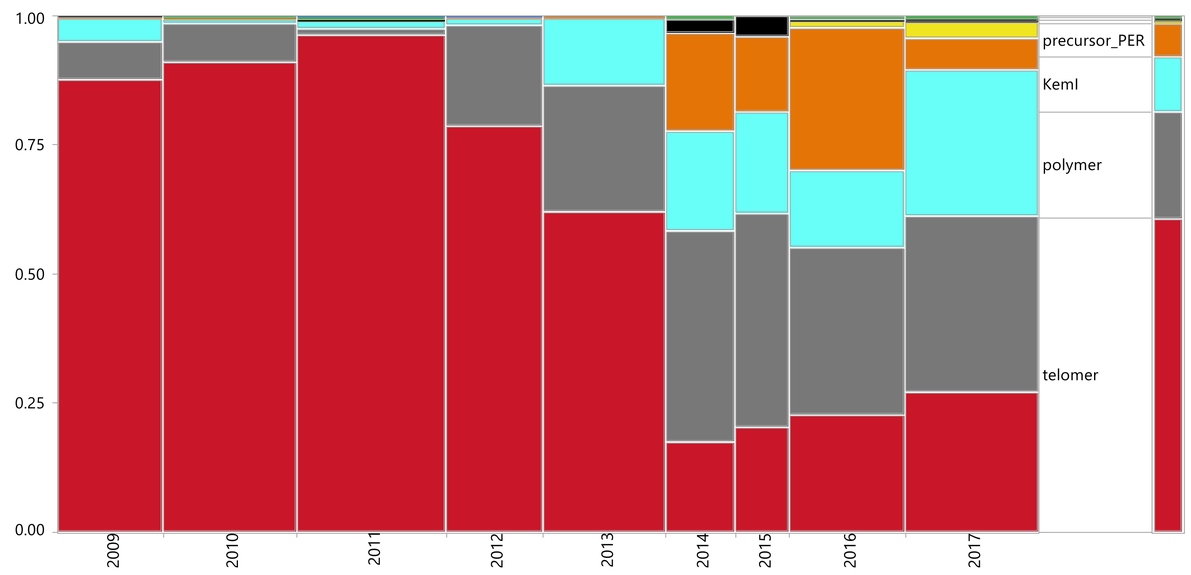


Figure 3 Mosaic plot of temporal trends of structure categories of PFAS substances in chemicals in Norway. Colours are the same as used in Fig. 1. To the far right the mean ratio of structure categories PFAS during the period.

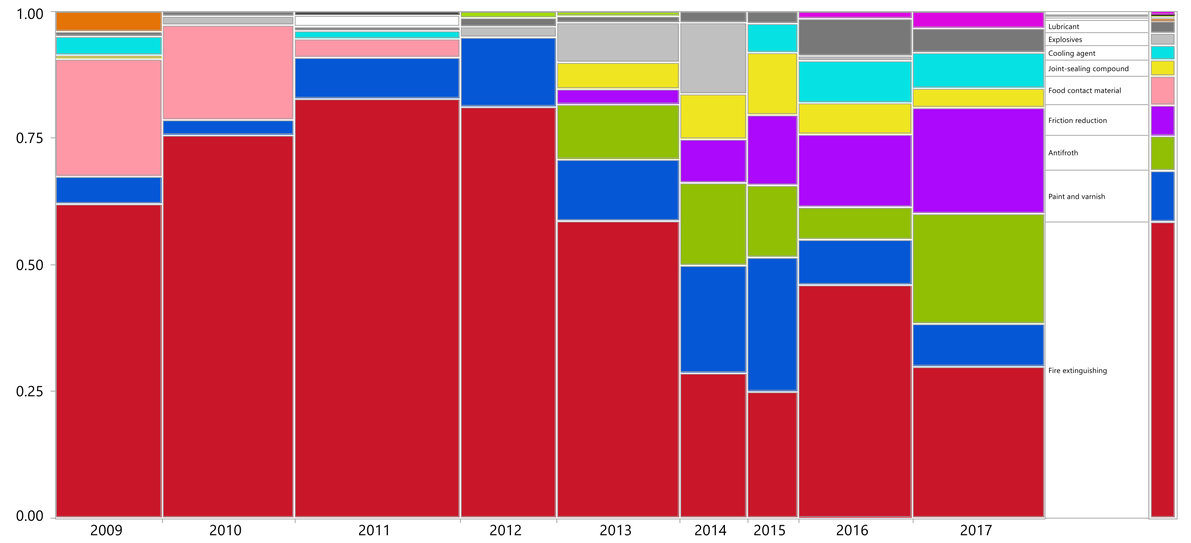


Figure 4 Mosaic plot of temporal trends of yearly ratio of product categories registered as containing PFASs in Norway. The areas are correlated to the tonnage used. To the far right the mean ratio product categories used during all years are shown. The same colour scheme as in Fig. 2 are used.

Conclusions

- The Norwegian Product Register (PR) is a **useful tool** for information about hazardous chemicals used in Norway
- PFAS are used in **high amounts** in Norway (**249 tons** 2009-2017)
- Amounts are **probably higher** than reported (Since not all PFAS are classified as hazardous, they are registered as a constituents of chemical products also containing other hazardous substances)
- **Fire-fighting** purposes has historically been the major use, but are **declining**
- Use in products that probably can utilise non-PFAS alternatives is **increasing**

Contact info: mgr@niva.no

Norwegian Institute for Water Research (NIVA), Oslo, Norway

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