Beskyttelse av vannressurser mot persistente, mobile og giftige (PMT) stoffer

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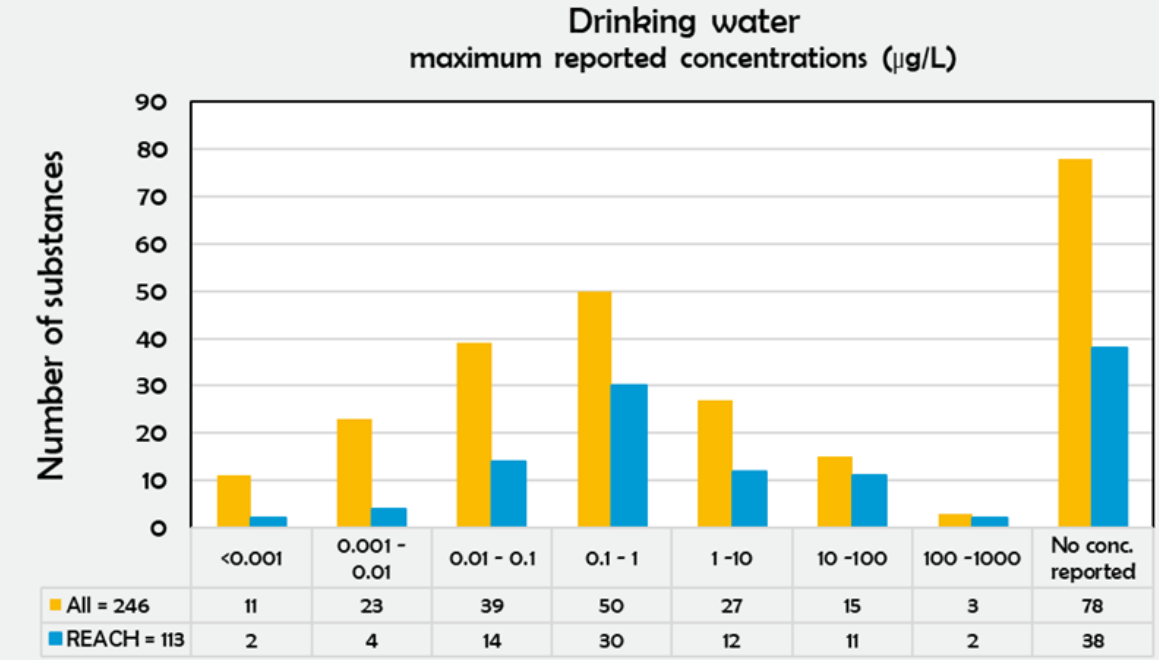
MILJØRINGEN
NETTVERK FOR FORURENSET GRUNN OG SEDIMENTER

Temamøte «Risikovurdering og tiltaksbehov på land og i sjø»
16-17.03.2022

Agenda

- Hva er en PMT-stoff (og vPvM stoff)
- Utvikling av PMT/vPvM kriteria under REACH
- Løsninger- H2020 ZeroPM

There are chemicals in drinking water

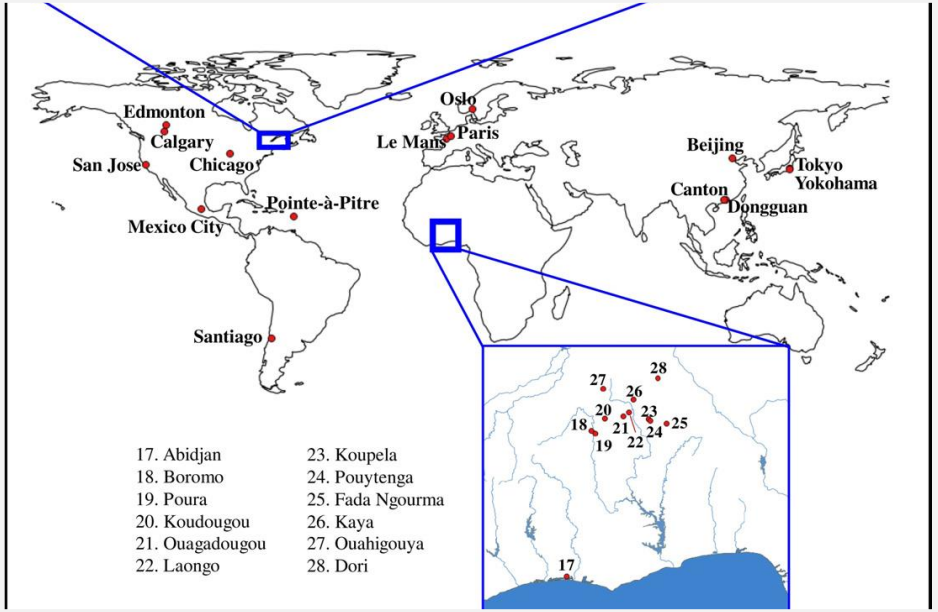


	<0.001	0.001 - 0.01	0.01 - 0.1	0.1 - 1	1 -10	10 -100	100 -1000	No conc. reported
All = 246	11	23	39	50	27	15	3	78
REACH = 113	2	4	14	30	12	11	2	38

Quelle: Arp and Hale (2019), FKZ: 3716 67 416 0

- Summary of 25 Studies conducted between 2000-2018

PFAS i Oslo's drinking water and the world's cities



- Kaboré et al. STOTEN 2018

Mean (ng/L) of PFAS in drinking water			
	Paris	Tokyo	Oslo
PFBA	0.91	3.31	1.56
PFPA	2.96	2.31	2.33
PFHxA	3.65	4.64	0.29
PFHpA	1.27	3.19	0.36
PFOA	**0.97**	**3.85**	**0.30**
PFNA	**0.11**	**4.46**	**0.32**
PFDA	0.1	0.30	0.16
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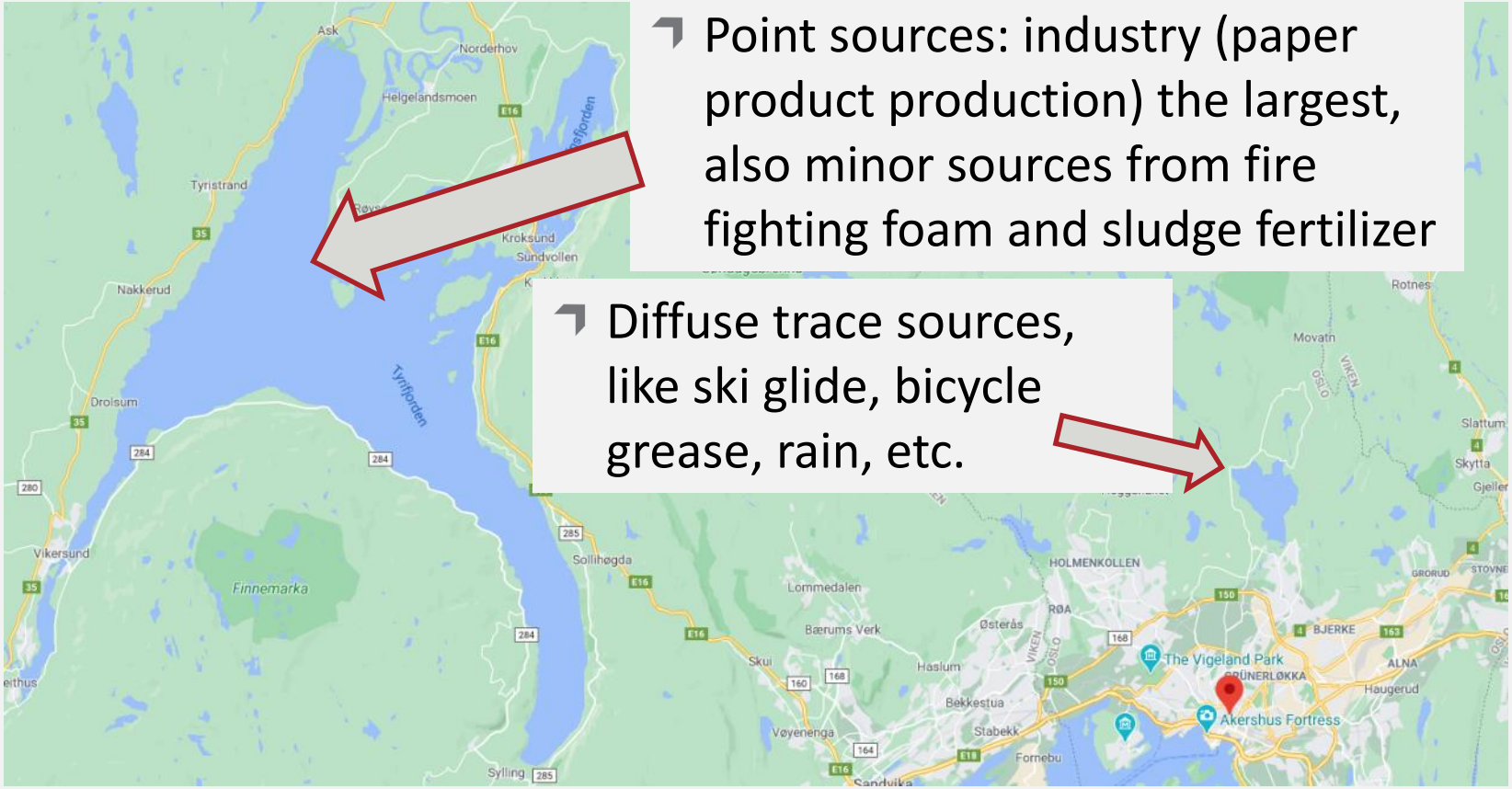
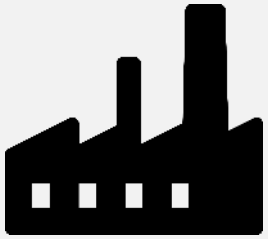
PFBS	0.16	1.06	0.07
PFHxS	**0.57**	**0.72**	**0.04**
PFOS	**1.06**	**1.14**	**0.17**
6:2 FTSA	6.43	0.07	-
∑EFSA PFAS	2.7	10.17	0.83
∑PFAS	18.39	25.18	5.78

Sources of PFAS in Maridalen &Tyrifjorden



- Point sources: industry (paper product production) the largest, also minor sources from fire fighting foam and sludge fertilizer
- Diffuse trace sources, like ski glide, bicycle grease, rain, etc.

Properties of a PMT substance



Chemical Synthesis

Uses / Products

Transport through the environment or infrastructure

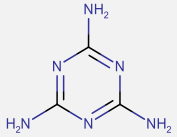
Water treatment and production

Consumption

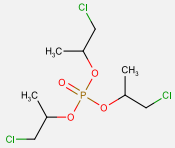
Persistency and Mobility

Toxicity

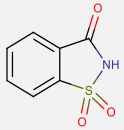
Not just PFAS



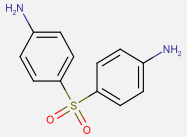
Melamine



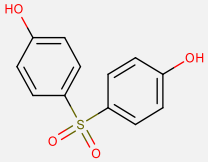
TCPP



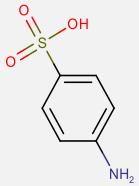
Saccharine



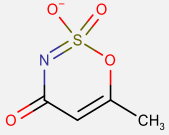
Dapsone



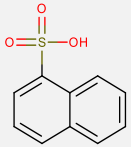
Bisphenol S



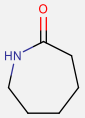
Sulfanilic acid



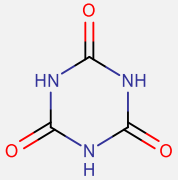
Acesulfame



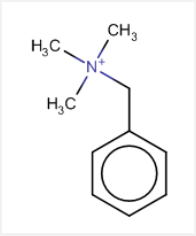
Naphthalene sulfonic acid



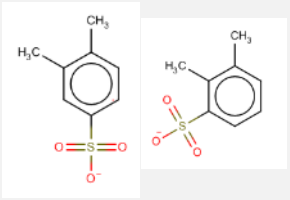
Ɛ-Caprolactam



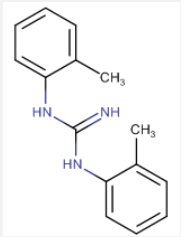
Cyanuric acid



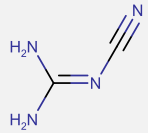
Benzyltrimethyl ammonium



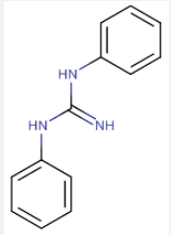
Dimethylbenzene sulfonic acid



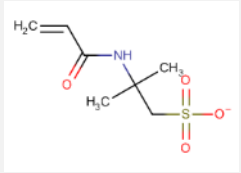
1,3-Di-*o*-tolylguanidine



Cyanoguanidine



1,3-Diphenylguanidine



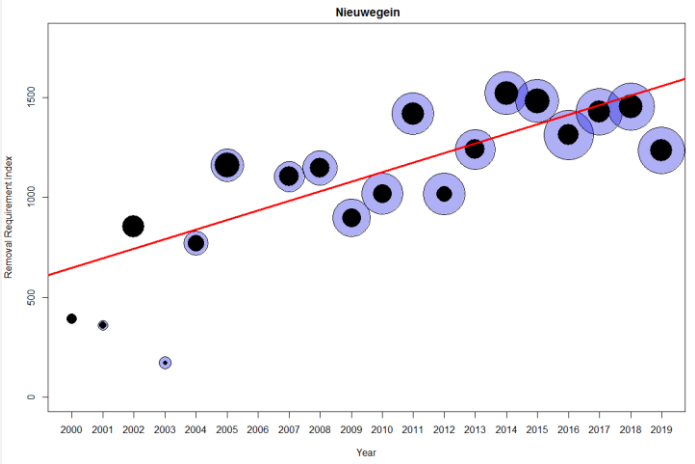
2-Acrylamido-2-methylpropane sulfonic acid

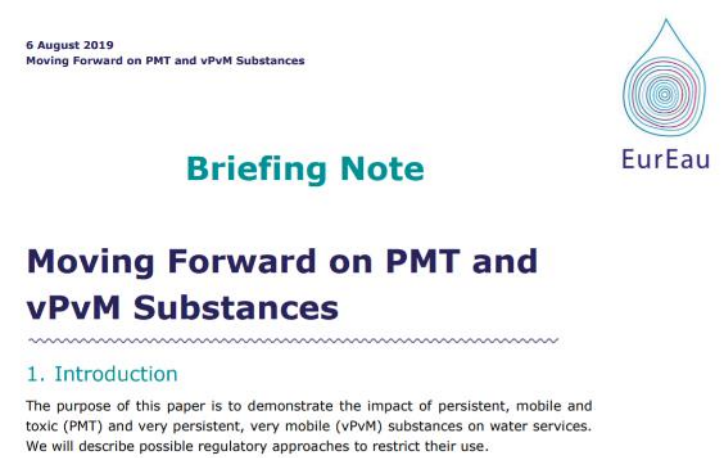
Schulze et al. Water Research, 2019

The need for hazard based criteria

- Persistent, mobile and toxic (PMT) and very persistent, very mobile (vPvM) substances are a threat to sources of drinking water
- Water suppliers have been raising concern, calling for stewardship by industry and regulatory action by authorities.

- Costs of NL water treatment due to PMT/vPvM substances




6 August 2019
Moving Forward on PMT and vPvM Substances

EurEau

Briefing Note

Moving Forward on PMT and vPvM Substances

1. Introduction

The purpose of this paper is to demonstrate the impact of persistent, mobile and toxic (PMT) and very persistent, very mobile (vPvM) substances on water services. We will describe possible regulatory approaches to restrict their use.

A water quality index for the removal requirement and purification treatment effort of micropollutants.
Water Supply 1 February 2021; 21 (1): 128–145. doi: https://doi.org/10.2166/ws.2020.289

Problem will get worse if no action taken

- Drinking wastewater a «sustainable» re-use

- No (expensive) remediation technology is perfect for all substances

- Increased, unknown exposure to PMT subtances

Setting the agenda in research

Comment

Tortajada and van Rensburg, Nature, 2020

One of five water-reuse plants in Singapore, which together supply about 40% of the nation's water for drinking and other uses.

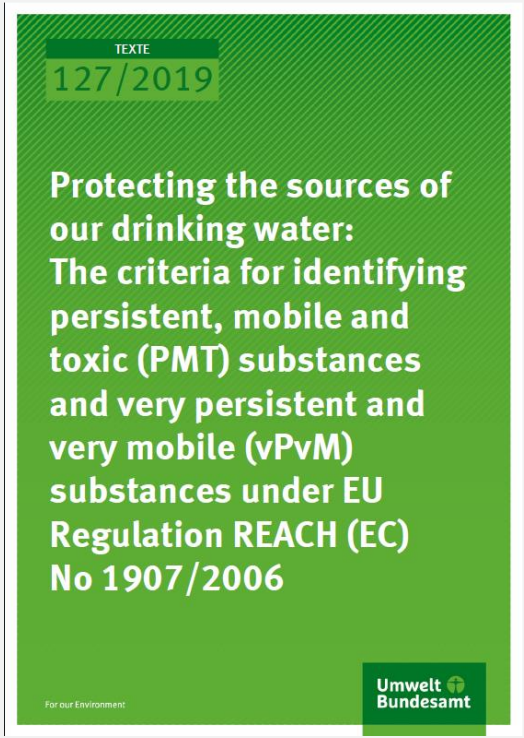
Drink more recycled wastewater

Cecilia Tortajada and Pierre van Rensburg

Development of PMT/vPvM criteria under REACH

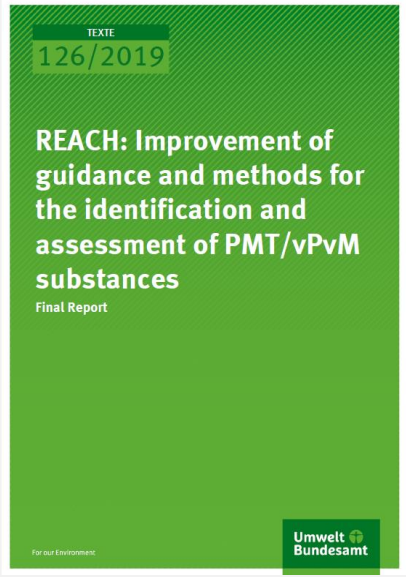
- Started already in 2009
  by German Environment Agency (UBA)
- Based on latest available science, as evaluated by expert committees (e.g. ECHA´s PBT expert group, dedicated workshops)
- Is consistent with existing chemical regulations (e.g. REACH, Ground water directive), or at least does not conflict with them
- Is practical, transparent, and feasible for compliance or enforcement

Derived Criteria

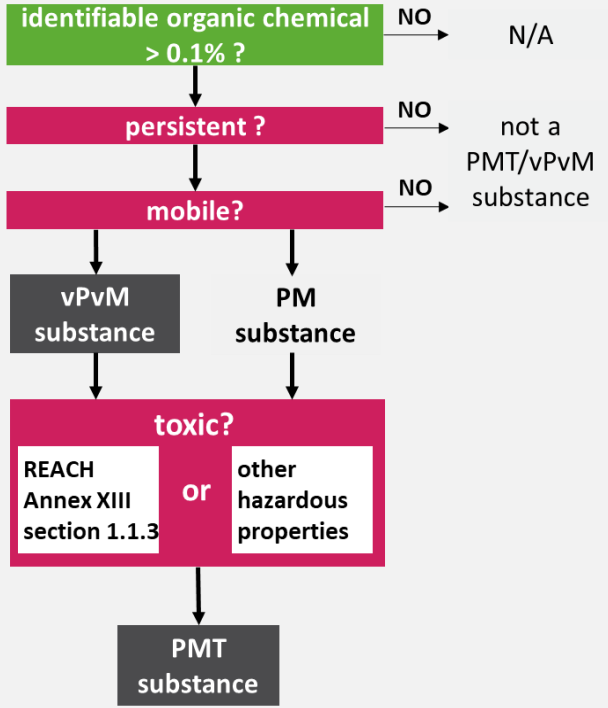


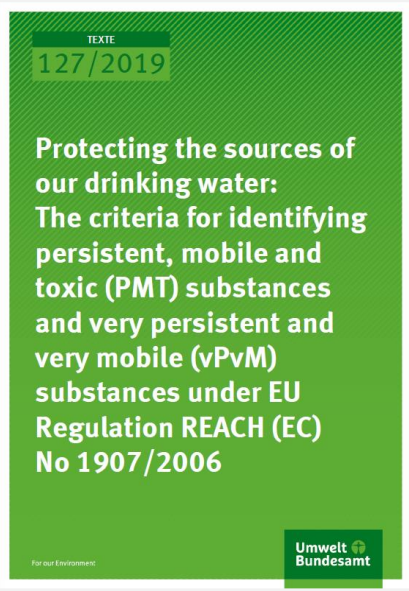
Neuman & Schliebner, 2019

PMT/vPvM substance criteria and guidelines



Scientific Background and Guidelines
Arp & Hale (2019)



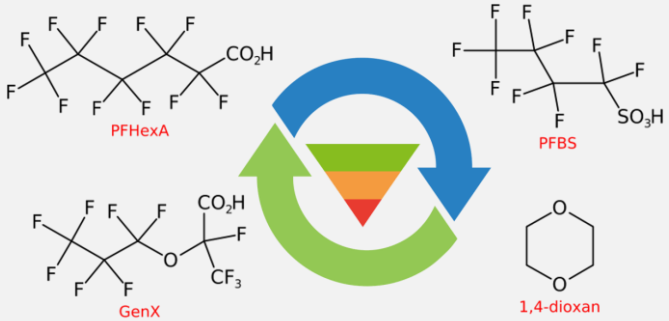


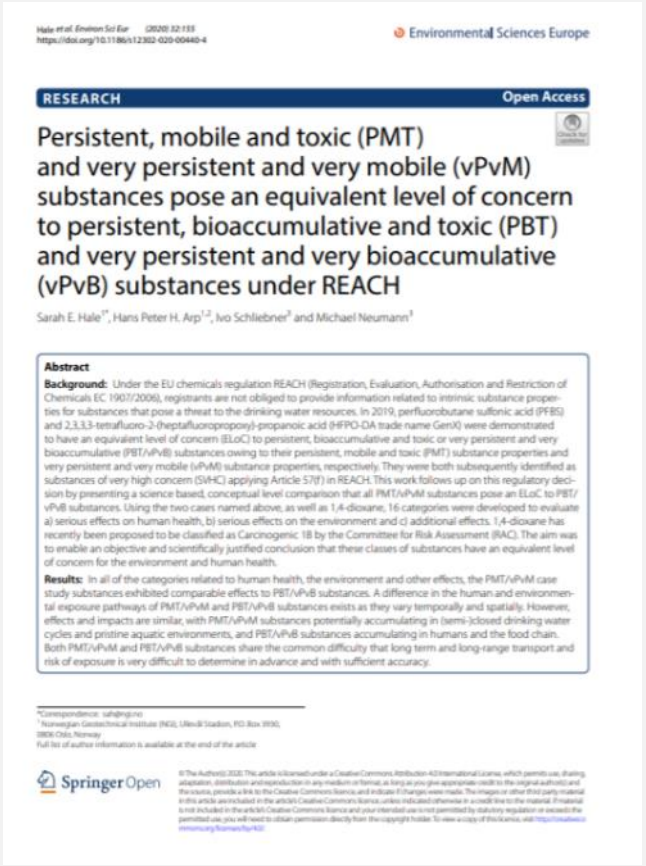
PMT/vPvM Criteria
Neumann & Schliebner (2019)

REACH: Equivalent Level of concern (ELoC) to PBT/vPvB substances

- PFBS, GenX and 1,4-dioxane identified by MSC as substance of very high concern (SVHC)
- Ongoing discussion: Restriction of PFHxA under REACH

- Under REACH assessed and compared 16 categories on health effects, environment effects and other effects
- Intrinsic substance properties cause hazard





Hale et al. Environ Sci Eur (2020) 32:155
https://doi.org/10.1186/s12302-020-00440-4

Environmental Sciences Europe

RESEARCH Open Access

Persistent, mobile and toxic (PMT) and very persistent and very mobile (vPvM) substances pose an equivalent level of concern to persistent, bioaccumulative and toxic (PBT) and very persistent and very bioaccumulative (vPvB) substances under REACH

Sarah E. Hale*, Hans Peter H. Arp[1,2], Ivo Schliebner[3] and Michael Neumann[3]

Abstract

Background: Under the EU chemicals regulation REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals EC 1907/2006), registrants are not obliged to provide information related to intrinsic substance properties for substances that pose a threat to the drinking water resources. In 2019, perfluorobutane sulfonic acid (PFBS) and 2,3,3,3-tetrafluoro-2-(heptafluoropropoxy)-propanoic acid (HFPO-DA trade name GenX) were demonstrated to have an equivalent level of concern (ELoC) to persistent, bioaccumulative and toxic or very persistent and very bioaccumulative (PBT/vPvB) substances owing to their persistent, mobile and toxic (PMT) substance properties and very persistent and very mobile (vPvM) substance properties, respectively. They were both subsequently identified as substances of very high concern (SVHC) applying Article 57(f) in REACH. This work follows up on this regulatory decision by presenting a science based, conceptual level comparison that all PMT/vPvM substances pose an ELoC to PBT/vPvB substances. Using the two cases named above, as well as 1,4-dioxane, 16 categories were developed to evaluate a) serious effects on human health, b) serious effects on the environment and c) additional effects. 1,4-dioxane has recently been proposed to be classified as Carcinogenic 1B by the Committee for Risk Assessment (RAC). The aim was to enable an objective and scientifically justified conclusion that these classes of substances have an equivalent level of concern for the environment and human health.

Results: In all of the categories related to human health, the environment and other effects, the PMT/vPvM case study substances exhibited comparable effects to PBT/vPvB substances. A difference in the human and environmental exposure pathways of PMT/vPvM and PBT/vPvB substances exists as they vary temporally and spatially. However, effects and impacts are similar, with PMT/vPvM substances potentially accumulating in (semi-)closed drinking water cycles and pristine aquatic environments, and PBT/vPvB substances accumulating in humans and the food chain. Both PMT/vPvM and PBT/vPvB substances share the common difficulty that long term and long-range transport and risk of exposure is very difficult to determine in advance and with sufficient accuracy.

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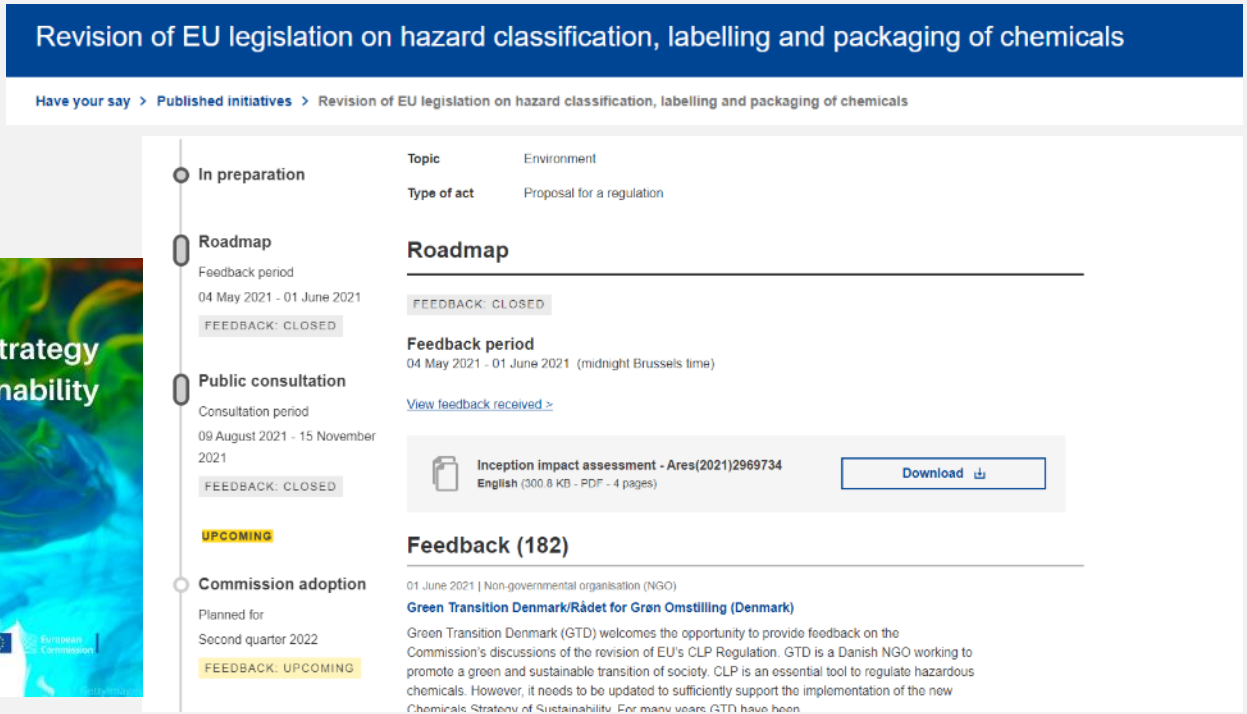
Full list of author information is available at the end of the article

PMT/vPvM an Equivalent Level of Concern to PBT/vPvB

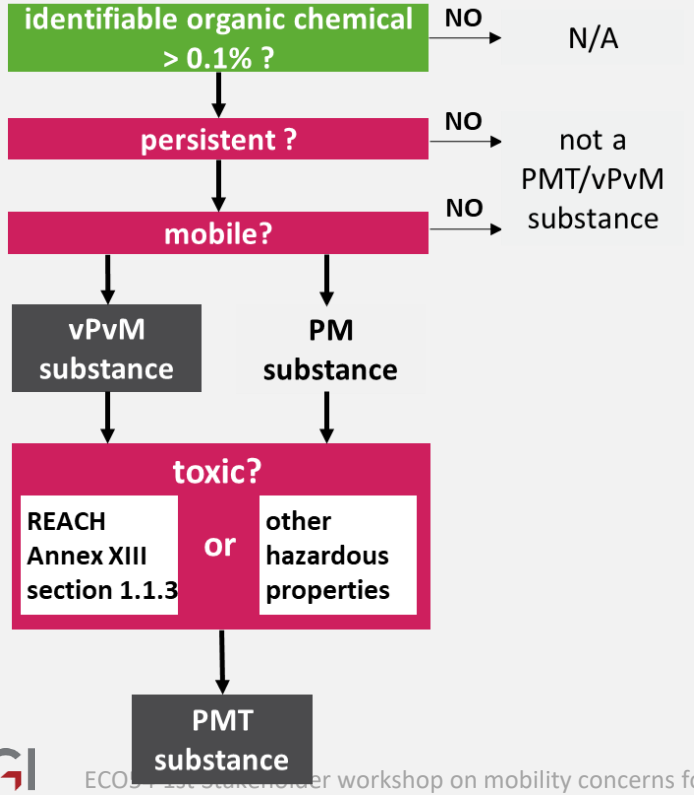
	REACH: PMT/vPvM Persistent,mobile,toxic	REACH: PBT/vPvB Persistent,bioaccummulative, toxic
Persistency & Toxicity	Criteria for P/vP identical and T nearly identical	
Exposure	*Chronic, inter-generational presence* in fresh/drinking water sources; accumulates relative to dilution rates	*Chronic, inter-generational presence* in food chain; accummulates relative to depuration rates
Criteria for Mobility (M) & Bioaccummuation (B)	**M**: Experimental log Koc < 4 *(breakthrough WWTP, bank filtrate)* **vM**: Experimental log Koc < 3 *(groundwater transport)*	**B**: Bioconcentration factor > 2000 **vB:** Bioconcentration factor > 5000

EU Green Deal:
PMT/vPvM criteria and hazard class to be introduced in Europe

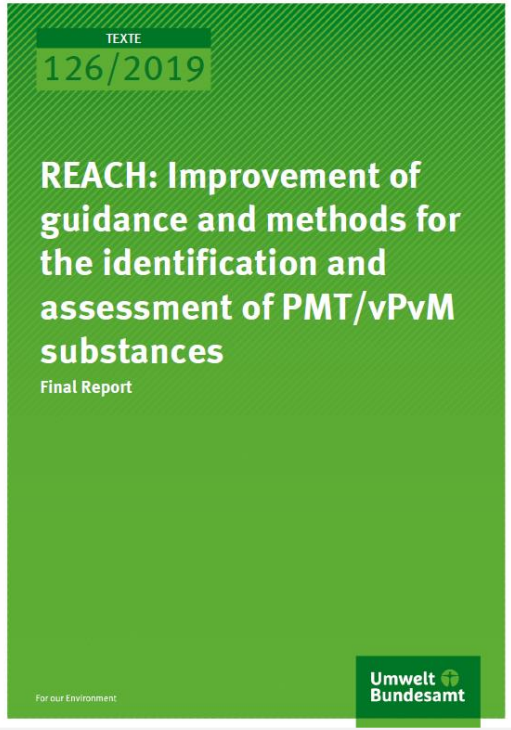
- Into force:
  - CLP 2022/3
  - REACH 2024
  - UN-GHS??



State-of-the-Art PMT/vPvM hazard assessment

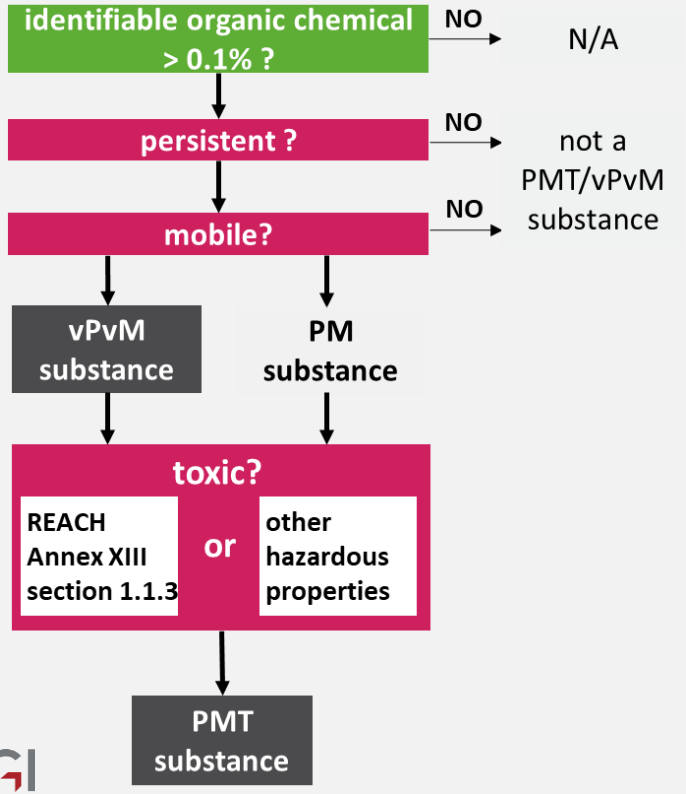


Scientific background and guidance



Arp & Hale, 2019

First Step: Assessing persistency (P and vP)

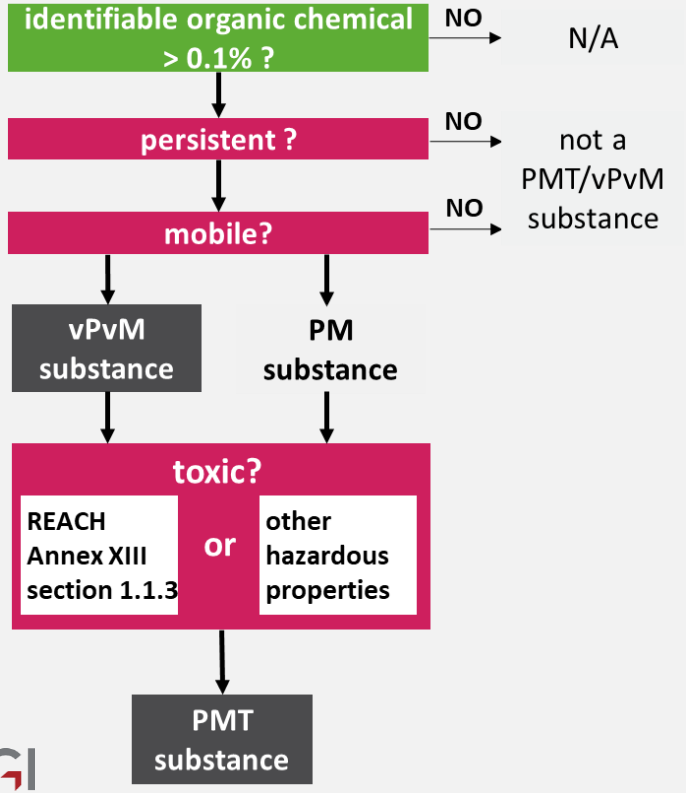


P and vP criteria identical to Annex XIII of REACH

	persistent (P) in any of the following situations	**very persistent (vP)** in any of the following situtations
marine water	half-life > 60 days	half-life > 60 days
fresh water	half-life > 40 days	half-life > 60 days
marine sediment	half-life > 180 days	half-life > 180 days
fresh water sediment	half-life > 120 days	half-life > 180 days
soil	half-life > 120 days	half-life > 180 days

ECHA Chapter R.11. Version 3.0 (June 2017)
Neumann & Schliebner (2019)

Second Step: Assessing Mobility (M and vM)



Currently <u>two</u> proposals for M and vM criteria

	Mobile (M) if it fulfills P or vP and the following situation	**very mobile (vM)** if it fulfills P or vP and the following situation
Neumann & Schliebner (2019) lowest experimental **log K_{OC}** (pH 4-9)	< 4.0	<3.0
EC proposal for CLP at CARACAL **log K_{OC}**	< 3.0	<2.0

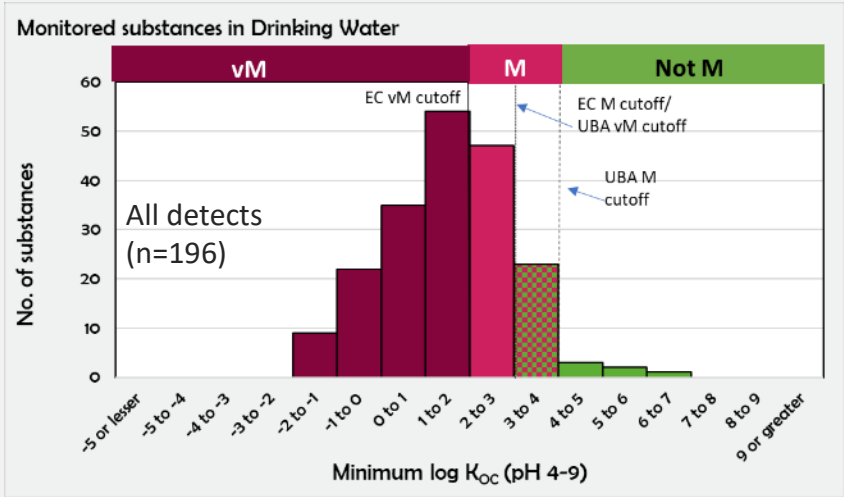
Mobility: Rationelle for log Koc and cutoff values

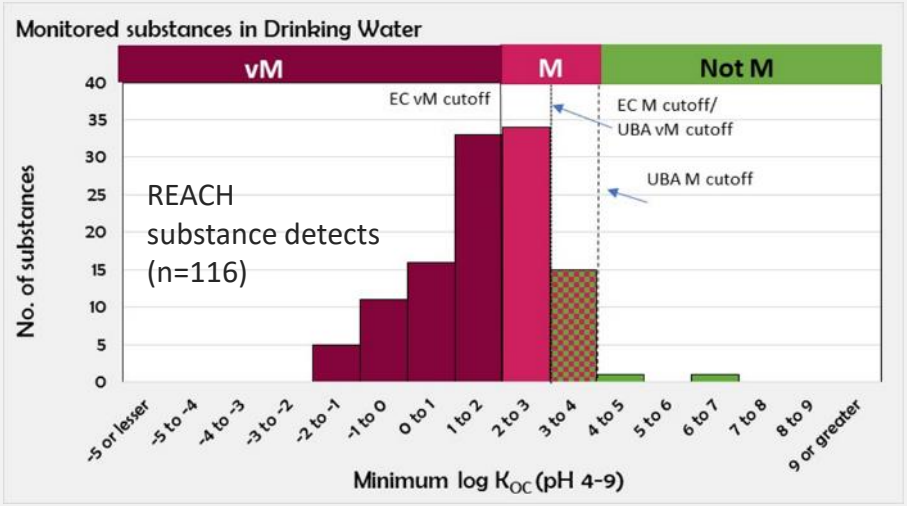
- Annex II section 12.4 of REACH
  - log K_{OC} is a way to describe soil mobility
- Half-lives combined with log Koc used by many organizations for mobility
  - Groundwater Ubiquity Score (1979)
  - EU Common Implementation Strategy Working Group (log Koc < 3.0)
  - Biocide regulation (log Koc < 2.7)
  - UNEP FAO (different categories)
- Simulation Model: If M (log Koc = 4.0) and P (soil half-life = 120 day)
  8% of river concentrations could penetrate bank filtration (sandy soil) to drinking water extraction points

NGI

Empirical Data compared with proposed log Koc cutoff values

- 196 chemicals (including 116 REACH substances) **detected** in drinking water **and** an **experimental log Koc value** is available
- Less detected substances are classified as PMT/vPvM if log K_{OC} cutoff is lowered





What about risk assessment?

European Food Safety Authority (EFSA)

tolerable weekly intake (TWI) of **4 PFAS** (PFHxS, PFOS, PFNA, PFOA) – 4.4 ng/kg body weight/week.

DVS: 70 kg mann, 3 L drikkevann per dag:
< 15 ng/L EFSA PFAS

10 kg barn, 2 L drikkevan per dag
< 3 ng/L EFSA PFAS

- Oslo «trygg» for EFSA PFAS i sw
- Men det finnes andre PFAS kilder

Mean (ng/L) of PFAS in drinking water			
	Paris	Tokyo	Oslo
PFBA	0.91	3.31	1.56
PFPA	2.96	2.31	2.33
PFHxA	3.65	4.64	0.29
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∑EFSA PFAS	2.7	10.17	0.83
∑PFAS	18.39	25.18	5.78

Ny H2020 Prosjekt: ZeroPM
Zero pollution of persistent, mobile substances

- ZeroPM will interlink and synergize three strategies to protect the environment and human health from persistent, mobile substances: **Prevent**, **Prioritize** and **Remove**.
- 11.6 Million €, 15 EU institutes
- Coordination NGI, Sarah Hale (PC) and Hans Peter Arp (co-PC)
- www.zeropm.eu

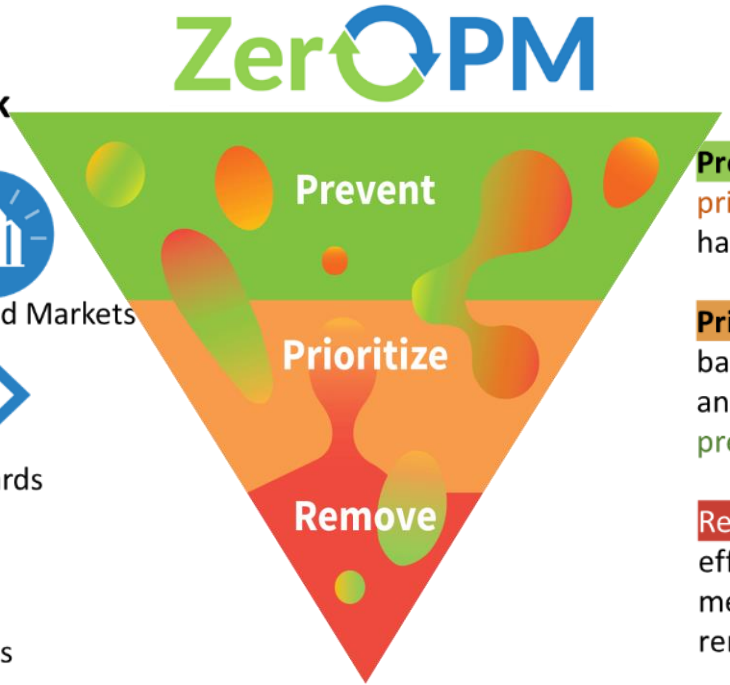
ZeroPM's concept

Multilevel framework

Chemical Technology, Policy and Markets

Water Exposure and Hazards

Remediation and Impacts



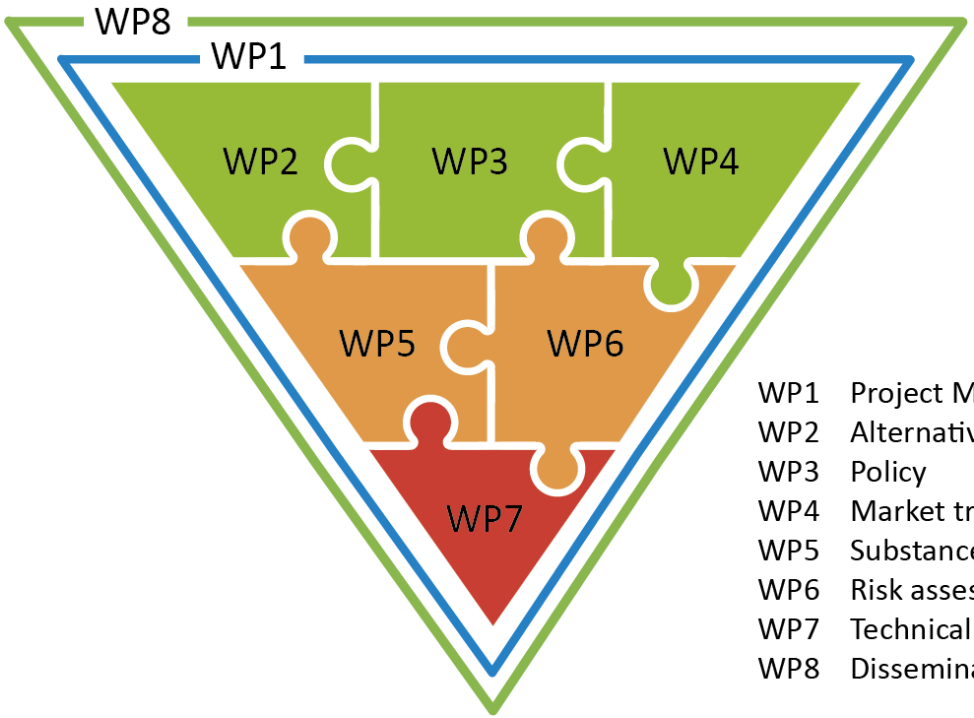
Interlinked Strategy

Preventing regrettable substitution for prioritized PM substances, by assessing hazards, sustainability, exposure and removal.

Prioritizing PM substances and groups based on intrinsic properties, exposure, and hazard to select those substances to prevent and remove most urgently

Removing prioritized PM substances via effective, sustainable and safe remediation methods, that prevent unfocused remediation effort

ZeroPM's work packages



WP1 Project Management
WP2 Alternatives Assessment
WP3 Policy
WP4 Market transition
WP5 Substance grouping
WP6 Risk assessment
WP7 Technical solutions
WP8 Dissemination & Communication

Thank-you! More information

- Funding from the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety of Germany (FKZ 3719 65 408 0)
  - www.umweltbundesamt.de/en/PMT-substances
- The EU research project **ZeroPM** funded by Horizon 2020 (No 101036756)
  - zeropm.eu (please subscribe to our newsletter!)

Umwelt Bundesamt

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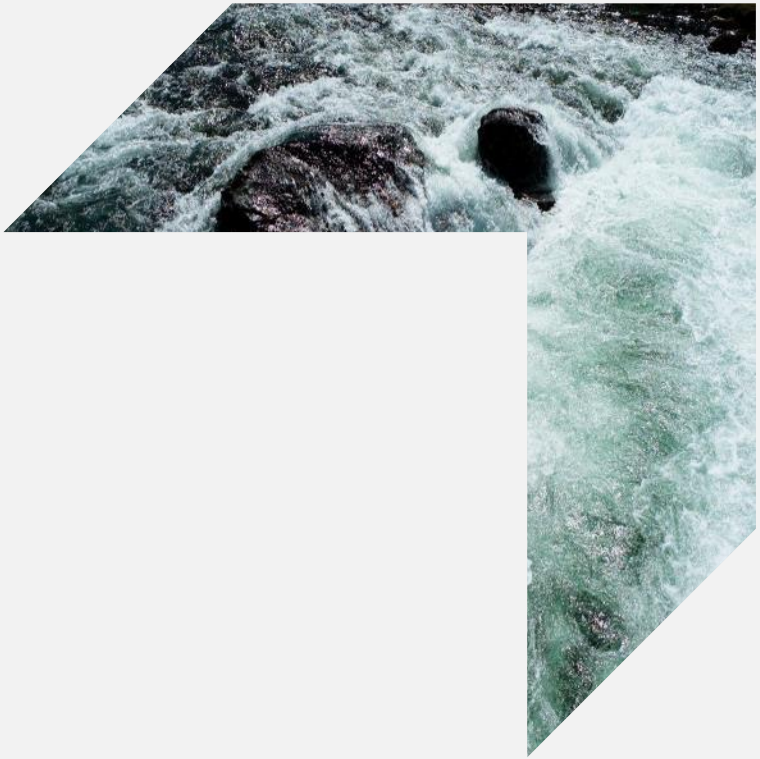
NGI



#påsikkergrunn

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