This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101036756

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Vereniging van Rivierwaterbedrijven

Policy options and other ways/tools to protect drinking water sources

ZeroPM
Prevent
Prioritize
Remove

André Bannink, senior policy advisor
ZeroPM webinar 'Protecting drinking water sources from persistent and mobile substances', 19 June 2023

Content

- European Legislation
  - Drinking Water Directive, Water Framework Directive (PFAS)
  - REACH & CLP (PMT criteria)
- Dutch working group on tackling emerging substances
  - Theme Group on PMT
    - PMT-scores for over 6,000 substances (this summer on RIVM website)
- Revision of permits due to SVHC

European Legislation: DWD

- Revised Drinking Water Directive
  - 15 December 2020: publication
  - 12 January 2023: into force

- New: PFAS standards
  - 12 January 2024: EC sets methods for monitoring of PFAS (under the parameters ‘PFAS Total’ and ‘Sum of PFAS’)
  - 12 January 2026: MS take measures necessary to ensure that water intended for human consumption complies with the parametric values for PFAS Total/Sum of PFAS

European Legislation: DWD

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DW Standards

- Sum of 20 PFAS < 100 ng/L
- PFAS total < 500 ng/L

CASRN	PFAS
375-22-4	Perfluorobutanoic acid (PFBA)
2706-90-3	Perfluoropentanoic acid (PFPA)
307-24-4	Perfluorohexanoic acid (PFHxA)
375-85-9	Perfluoroheptanoic acid (PFHpA)
335-67-1	Perfluorooctanoic acid (PFOA)
375-95-1	Perfluorononanoic acid (PFNA)
335-76-2	Perfluorodecanoic acid (PFDA)
2058-94-8	Perfluoroundecanoic acid (PFUnDA)
307-55-1	Perfluorododecanoic acid (PFDoDA)
72629-94-8	Perfluorotridecanoic acid (PFTrDA)

CASRN	PFAS
375-73-5	Perfluorobutane sulfonic acid (PFBS)
2706-91-4	Perfluoropentane sulfonic acid (PFPS)
355-46-4	Perfluorohexane sulfonic acid (PFHxS)
375-92-8	Perfluoroheptane sulfonic acid (PFHpS)
1763-23-1	Perfluorooctane sulfonic acid (PFOS)
68259-12-1	Perfluorononane sulfonic acid (PFNS)
335-77-3	Perfluorodecane sulfonic acid (PFDS)
749786-16-1	Perfluoroundecane sulfonic acid
79780-39-5	Perfluorododecane sulfonic acid
791563-89-8	Perfluorotridecane sulfonic acid

ZerOPM

EUROPEAN COMMISSION

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European Legislation: WFD

Brussels, 26.10.2022
COM(2022) 540 final

2022/0344 (COD)

- Current revision Water Framework Directive
  - 26 October 2022: proposal publication

Proposal for a

DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

amending Directive 2000/60/EC establishing a framework for Community action in the field of water policy, Directive 2006/118/EC on the protection of groundwater against pollution and deterioration and Directive 2008/105/EC on environmental quality standards in the field of water policy

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European Legislation: WFD

Proposal for EQSs

(WFD Standards)

- Sum of 24 PFAS < 0.0044 µg/L (4.4 ng/L) PEQ for groundwater and surface water
- 16 PFAS also in DWD
  - WFD Stricter standards
  - WFD PEQ vs DWD sum/total

Parameter	CASRN	RPF
Perfluorooctanoic acid (PFOA)	335-67-1	1
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	2
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.6
Perfluorononanoic acid (PFNA)	375-95-1	10
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.001
Perfluorohexanoic acid (PFHxA)	307-24-4	0.01
Perfluorobutanoic acid (PFBA)	375-22-4	0.05
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.03
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.3005
Perfluorodecanoic acid (PFDA)	335-76-2	7
Perfluorododecanoic acid (PFDoDA or PFDoA)	307-55-1	3
Perfluoroundecanoic acid (PFUnDA or PFUnA)	2058-94-8	4
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.505
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	1.65
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	1.3
Perfluorodecane sulfonic acid (PFDS)	335-77-3	2
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.3
Perfluorohexadecanoic acid (PFHxDA)	67905-19-5	0.02
Perfluorooctadecanoic acid (PFODA)	16517-11-6	0.02
Ammonium perfluoro (2-methyl-3-oxahexanoate) (HFPO-DA or Gen X)	62037-80-3	0.06
Propanoic Acid / Ammonium 2,2,3-trifluoro-3-(1,1,2,2,3,3-hexafluoro3-(trifluoromethoxy)propoxy)propanoate (ADONA)	958445-44-8	0.03
2-(Perfluorohexyl)ethyl alcohol (6:2 FTOH)	647-42-7	0.02
2-(Perfluorooctyl)ethanol (8:2 FTOH)	678-39-7	0.04
Acetic acid / 2,2-difluoro-2-((2,2,4,5-tetrafluoro-5-(trifluoromethoxy)-1,3-dioxolan-4- yl)oxy)-	1190931-41-9	0.06

20 + 24 = 28 PFAS?

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Are there really 6 million PFAS in PubChem?

Assoc. Prof. Dr. Emma Schymanski

Environmental Cheminformatics, Luxembourg Centre for Systems Biomedicine, University of Luxembourg

Dr. Evan Bolton

National Center for Biotechnology Information, National Library of Medicine, National Institutes of Health

Luxembourg National Research Fund

uni.lu | LCSB

NIH U.S. National Library of Medicine
National Center for Biotechnology Information

Today's slides zenodo

DOI:10.5281/zenodo.7756622

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101036756.

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20 + 24 = 28 PFAS?

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No…it's already 7 million!

PFAS and Fluorinated Compounds in PubChem	20,929,881
OECD PFAS definition	6,370,077
Organofluorine compounds	19,963,719
Other diverse fluorinated compounds	122,266
PFAS and fluorinated compound collections	1,789,330
PFAS breakdowns by chemistry	7,299,804
Regulatory PFAS collections	26,965

ZeroPM

PFAS & REACH

ECHA publishes PFAS restriction proposal

ECHA/NR/23/04

The details of the proposed restriction of around 10 000 per- and polyfluoroalkyl substances (PFASs) are now available on ECHA's website. ECHA's scientific committees will now start evaluating the proposal in terms of the risks to people and the environment, and the impacts on society.

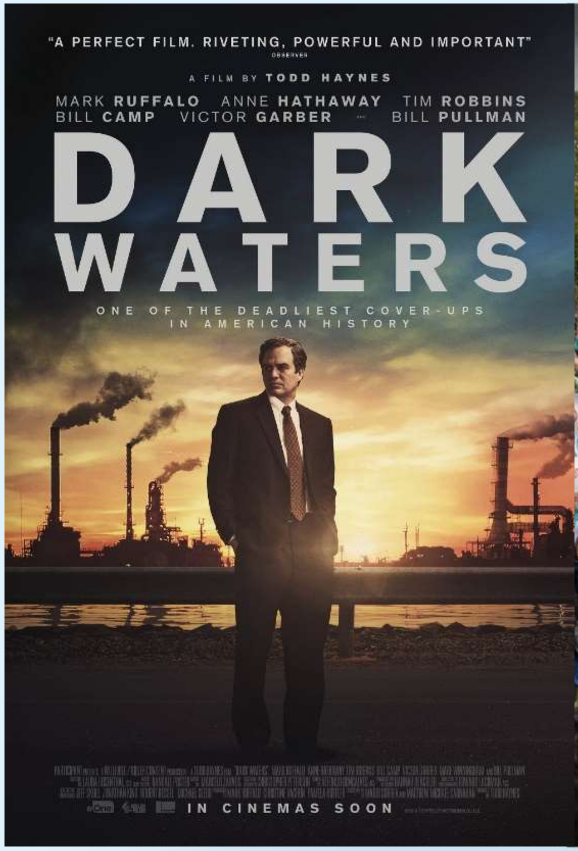
Helsinki, 7 February 2023 – The proposal was prepared by authorities in Denmark, Germany, the Netherlands, Norway and Sweden and submitted to ECHA on 13 January 2023. It aims to reduce PFAS emissions into the environment and make products and processes safer for people.

All PFASs in the scope of the proposal are very persistent in the environment. If their releases are not minimised, people, plants and animals will be increasingly exposed, and without a restriction, such levels will be reached that have negative effects on people's health and the environment. The authorities estimate that around 4.4 million tonnes of PFASs would end up in the environment over the next 30 years unless action is taken.

Peter van der Zandt, ECHA's Director for Risk Assessment said: "This landmark proposal by the five authorities supports the ambitions of the EU's Chemicals Strategy and the Zero Pollution action plan. Now, our scientific committees will start their evaluation and opinion forming. While the evaluation of such a broad proposal with thousands of substances, and many uses, will be challenging, we are ready."

Source: https://echa.europa.eu/nl/-/echa-publishes-pfas-restriction-proposal

PFAS restrictions: why?



Veneto, Italy

The Miteni chemical plant contaminated the drinking water of over 350,000 residents with PFOA.

Key Information

In a biomonitoring study of 18,122 exposed residents, PFOA showed the highest levels (max 1,400 ng/ml) followed by PFOS and PFHxS.

Over 350,000 residents in Veneto are estimated to have been exposed to the contamination through tap water.

Read More | Take Action | Share

https://www.env-health.org/BanPFAS/

PFAS restrictions: why?

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THURSDAY, 15 JUNE 2023 - 09:44

Dordrecht chemical company aware of its carcinogenic PFAS pollution 30 years ago: report

Teflon producer DuPont, now Chemours, has known for 30 years that they are seriously polluting the groundwater in Dordrecht with large amounts of toxic and carcinogenic PFAS, Zembla reports based on confidential documents from the chemical group. The documents showed DuPont had serious concerns about contaminating the drinking water with PFAS in the early 1990s. PFAS pollution is still a problem in Doredrecht.

In 1993, DuPont measured PFAS concentration in the groundwater in Dordrecht and found them to be 75 times higher than their own standard. The DuPont headquarters in the United States considered the contamination of the environment around the Dordrecht factory serious enough to give it "the highest priority," according to Zembla. It appointed a PFAS coordinator in Dordrecht, which noted that broken and ruptured pipes had leaked "large quantities" of PFAS into the environment, creating "a landfill" under the factory.

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REACH & CLP

New CLP hazard classes have entered into force, ECHA updates relevant guidance and tools

The new CLP hazard classes entered into force on 20 April 2023. New requirements will apply to new substances from 1 May 2025 (and from 1 November 2026 for substances placed on the market before 1 May 2025). For new mixtures placed on the market, requirement will apply from 1 May 2026 (1 May 2028 for mixtures placed on the market before 1 May 2026). ECHA is currently updating all guidance and tools to include the new hazard classes: the harmonised classification and labelling (CLH) proposal template is already updated; new hazard classes will be included in the IT tool IUCLID in spring 2024 so that companies can submit information related to the new hazard classes; and the guidance on applying the CLP criteria is expected to be updated by mid-2024.

Source: https://zeropm.eu/news/

REACH & CLP

New EU hazard statements:

Hazard class and category code	Hazard statement code	Hazard statement
ED HH 1	EUH380	May cause endocrine disruption in humans
ED HH 2	EUH381	Suspected of causing endocrine disruption in humans
ED ENV 1	EUH430	May cause endocrine disruption in the environment
ED ENV 2	EUH431	Suspected of causing endocrine disruption in the environment
PBT	EUH440	Accumulates in the environment and living organisms including in humans
vPvB	EUH441	Strongly accumulates in the environment and living organisms including in humans
PMT	EUH450	Can cause long-lasting and diffuse contamination of water resources
vPvM	EUH451	Can cause very long-lasting and diffuse contamination of water resources

Source: https://echa.europa.eu/nl/new-hazard-classes-2023

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PMT criteria: why?

Environmental Science & Technology

Feature

pubs.acs.org/est

2016

Mind the Gap: Persistent and Mobile Organic Compounds—Water Contaminants That Slip Through

Thorsten Reemtsma,[*,†] Urs Berger,[†] Hans Peter H. Arp,[‡] Hervé Gallard,[§] Thomas P. Knepper,[∥] Michael Neumann,[⊥] José Benito Quintana,[#] and Pim de Voogt[∇,○]

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DOI: 10.1021/acs.est.6b03338
Environ. Sci. Technol. 2016, 50, 10308−10315

POSITION // OCTOBER 2017

Protecting the sources of our drinking water

A revised proposal for implementing criteria and an assessment procedure to identify Persistent, Mobile and Toxic (PMT) and very Persistent, very Mobile (vPvM) substances registered under REACH

2017

https://www.umweltbundesamt.de/sites/default/files/medien/1410/publikationen/171027_uba_pos_pmt_substances_engl_2aufl_bf.pdf

German Environment Agency

Umwelt Bundesamt

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PMT criteria: why?

TEXTE
126/2019

REACH: Improvement of guidance and methods for the identification and assessment of PMT/vPvM substances

Final Report

2019

https://www.umweltbundesamt.de/publikationen/protecting-the-sources-of-our-drinking-water-the

For our Environment

Umwelt Bundesamt

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

2020

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

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

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101036756

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NL tackling emerging substances

Working Group

Themes

- Biocides
- Cooling water additives
- Melamine
- PFAS
- NTS
- PMT substances

English Contact Sitemap

Rijksoverheid

Helpdesk Water

Home Actueel Onderwerpen Organisatie Waterbegrippen Stel een vraag Zoeken

Home > Onderwerpen > Emissiebeheer > Aanpak opkomende stoffen >

Werkgroep "aanpak opkomende stoffen" onderzoekt de schadelijkheid van nieuwe en onbekende stoffen

De werkgroep "aanpak opkomende stoffen" onderzoekt de schadelijkheid van onbekende stoffen. Zij gebruikt gegevens over voorkomen, gebruik en toxiciteit om stofgroepen te vinden die een bedreiging kunnen vormen voor de waterkwaliteit. Voor deze stoffen gaat zij op zoek naar informatie over schadelijkheid, informatie over bronnen en adviseert over een mogelijke aanpak.

Rol en samenstelling van de werkgroep

rol van de werkgroep, samenstelling, werkwijze

→ Rol en samenstelling van de werkgroep

Opkomende stoffen die aandacht vragen

Het gaat om biociden, koelwateradditieven, melamine, perfluorverbindingen, non target screening, PMT stoffen

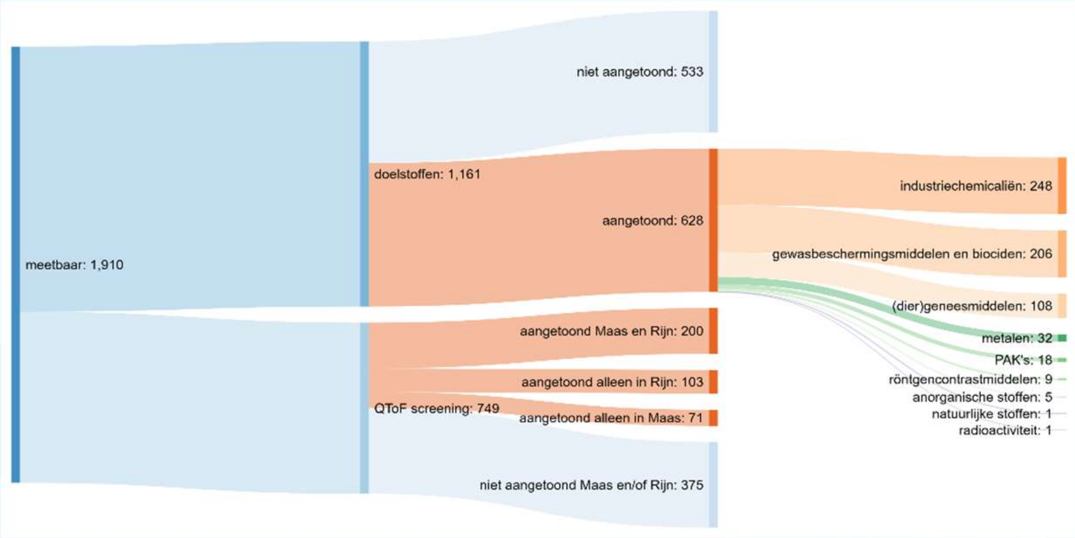
→ Opkomende stoffen die aandacht vragen

Delen

NL PMT Theme Group

Started in 2019 and is a collaboration between

- Ministry of Infrastructure and Water management
- RIVM National Institute for Public Health and the Environment
- Rijkswaterstaat
- Waterboards
- Drinking water companies



NL PMT Theme Group

Vereniging van Rivierwaterbedrijven

Dataset with properties of ≈ 65,000 substances

- How to focus/prioritise?
- Scoring system was developed based on PMT-criteria
  - 6,158 substances were selected (= meet PMT-criteria)
- Outcome was checked against monitoring results (≈ reality check ✓)
  - 1,161 substances were detected in rivers Rhine and/or Meuse

RESEARCH Open Access

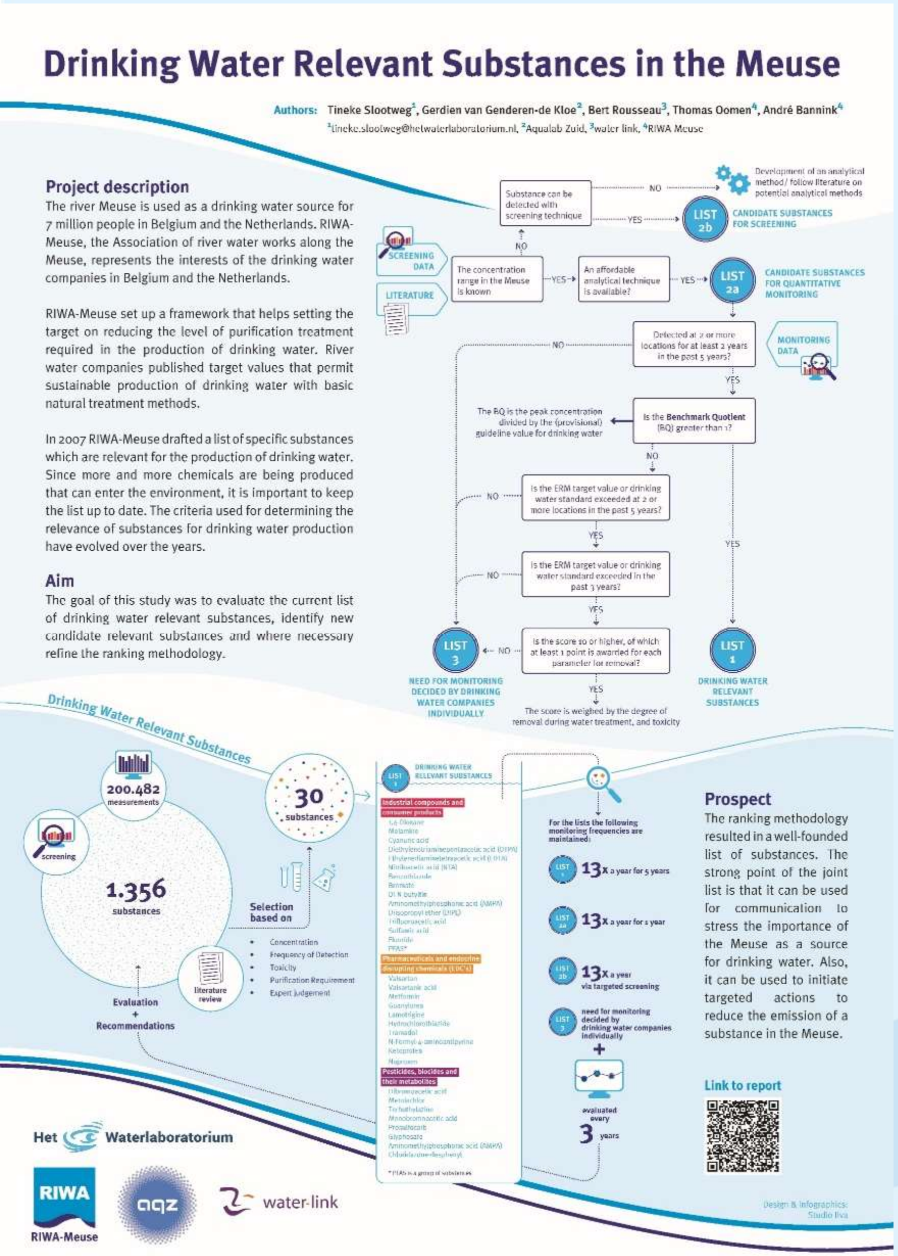
Screening and prioritising persistent, mobile and toxic chemicals: development and application of a robust scoring system

Julia Hartmann[1*], Emiel Rorije[1], Pim N. H. Wassenaar[1] and Eric Verbruggen[1]

2 June 2023

Environ Sci Eur **35**, 40 (2023). https://doi.org/10.1186/s12302-023-00749-w

ZeroPM



Relevant substances

Example:

- RIWA-Meuse evaluates relevant substances every 3 years
- Latest version 2021
  - Poster presented at SETAC Dublin 2023
  - 30 DW relevant substances (list 1)

https://www.riwa-maas.org/en/publicatie/1892/

Drinkingwater relevant substances			RIVM-score PMT			
#	Compound	Category	PMT-score	P-score	M-score	T-score
1a	valsartan	pharmaceutical	vPvM & PMT			
1b	valsartanic acid	pharmaceutical				
2a	metformin	pharmaceutical	0.334	0.117	0.956	0.335
2b	guanylurea	pharmaceutical	0.293	0.097	0.777	0.335
3	lamotrigine	pharmaceutical	0.642	0.765	0.469	0.738
4	dibromoacetic acid	industrial	0.325	0.058	0.733	0.809
5	1,4-dioxane	industrial	0.384	0.093	0.726	0.838
6	hydrochlorothiazide	pharmaceutical	0.613	0.586	0.644	0.611
7	melamine	industrial	0.636	0.529	0.800	0.607
8	tramadol	pharmaceutical	0.384	0.670	0.507	0.167
9	cyanuric acid	industrial	vPvM			
10	metolachlor	pesticide	0.576	0.597	0.433	0.738
11	diethylenetriaminepentaacetic acid (DTPA)	industrial	0.258	0.026	0.964	0.676
12	ethylenediaminetetraacetic acid (EDTA)	industrial	0.227	0.018	0.945	0.684
13	N-formyl-4-aminoantipyrine	pharmaceutical	0.461	0.236	0.685	0.606
14	nitriloacetic acid (NTA)	industrial	0.129	0.012	0.942	0.184
15	terbuthylazine	pesticide	0.601	0.861	0.416	0.607
16	benzothiazole	industrial	0.280	0.121	0.544	0.333
17	bromate	industrial	0.301	0.084	0.733	0.444
18	di-n-butyltin	industrial				
19	ketoprofen	pharmaceutical	0.263	0.112	0.487	0.333
20	monobromoacetic acid	industrial/biocide	0.283	0.037	0.754	0.822
21	naproxen	pharmaceutical	0.317	0.113	0.505	0.556
22	prosulfocarb	pesticide	0.353	0.259	0.279	0.606
23	glyphosate	pesticide	0.247	0.046	0.965	0.341
24	aminomethylphosphonic acid (AMPA)	pesticide/industrial (metabolite)	0.299	0.096	0.837	0.334
25	chloridazone-desphenyl	pesticide (metabolite)				
26	diisopropyl ether2	industrial	0.346	0.100	0.556	0.747
27	trifluoroacetic acid	industrial	0.344	0.161	0.748	0.336
28	sulfamic acid	industrial				
29	fluoride	industrial				

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Vereniging van Rivierwaterbedrijven

PMT-scores RIVM

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Drinkingwater relevant substances			RIVM-score PMT			
#	Compound	Category	PMT-score	P-score	M-score	T-score
30	PFAS	industrial				
	Perfluorobutanoic acid (PFBA)	industrial	0.570	0.623	0.613	0.484
	Perfluoropentanoic acid (PFPA)	industrial	0.627	0.829	0.550	0.539
	Perfluorohexanoic acid (PFHxA)	industrial	0.651	0.934	0.486	0.608
	Perfluoroheptanoic acid (PFHpA)	industrial	0.427	0.999	0.234	0.333
	Perfluorooctanoic acid (PFOA)	industrial	0.603	0.992	0.362	0.610
	Perfluorononanoic acid (PFNA)	industrial	0.571	0.997	0.305	0.610
	Perfluorodecanoic acid (PFDA)	industrial	0.537	0.999	0.254	0.610
	Perfluoroundecanoic acid (PFUnDA)	industrial	0.503	1.000	0.208	0.610
	Perfluorododecanoic acid (PFDoDA)	industrial	0.469	1.000	0.169	0.610
	Perfluorotridecanoic acid (PFTrDA)	industrial	0.436	1.000	0.136	0.610
	Perfluorobutane sulfonic acid (PFBS)	industrial	0.630	0.918	0.512	0.532
	Perfluoropentane sulfonic acid (PFPS)	industrial	0.695	0.971	0.448	0.771
	Perfluorohexane sulfonic acid (PFHxS)	industrial	0.595	0.990	0.385	0.553
	Perfluoroheptane sulfonic acid (PFHpS)	industrial	0.566	0.996	0.327	0.554
	Perfluorooctane sulfonic acid (PFOS)	industrial	0.533	0.999	0.274	0.555
	Perfluorononane sulfonic acid (PFNS)	industrial				
	Perfluorodecane sulfonic acid (PFDS)	industrial	0.467	1.000	0.184	0.554
	Perfluoroundecane sulfonic acid	industrial				
	Perfluorododecane sulfonic acid	industrial				
	Perfluorotridecane sulfonic acid	industrial				

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PMT-scores RIVM

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Permits

Combining science and legislation to protect the surface water sources of our drinking water: A call for concerted action

- Opinion paper in WATERSOLUTIONS 2021
  https://gwf-wasser.de/download/riwa-opinion-paper-2021/#
- Presentation in UBA Workshop - Getting control of PMT and vPvM substances under REACH (March 2021)
  https://www.umweltbundesamt.de/sites/default/files/medien/3521/dokumente/day_2_afternoon_04_harrie_timmer_corrected.pdf

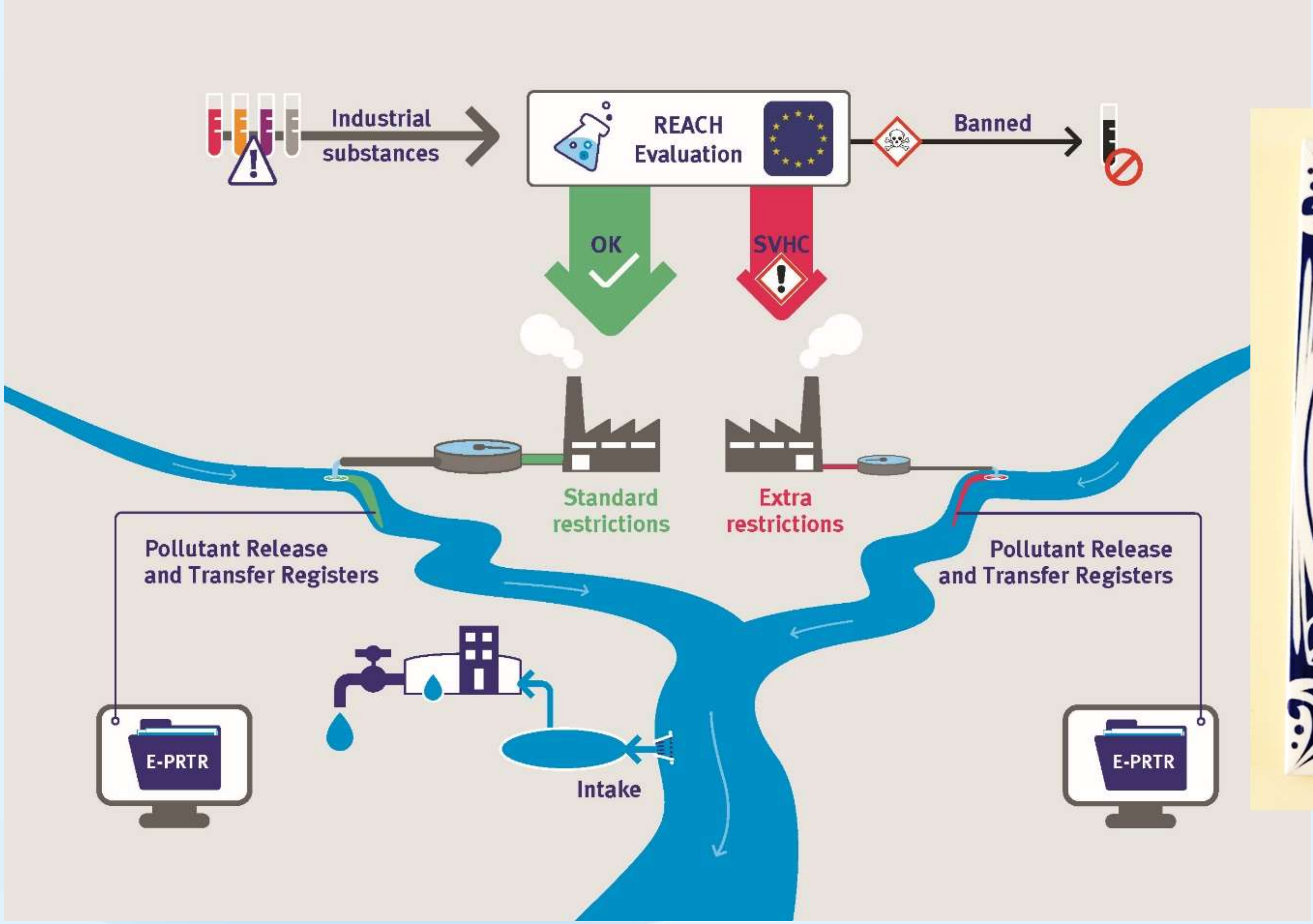
WATER REPORT

Combining science and legislation to protect the surface water sources of our drinking water

A call for concerted action

WATERSOLUTIONS | 2021

Thank you for your attention



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IWW Zentrum Wasser

Deutscher Verein des Gas- und Wasserfaches e.V. DVGW

www.dvgw.de

PFAS in European Drinking Waters

Regulation, Analytical Cchallenges, Data

Dr. Ulrich Borchers, IWW Water Centre, Germany

Legislation

European Drinking Water Directive, National Legislation

European Legislation

23.12.2020 | EN | Official Journal of the European Union | L 435/1

European Commission

I

(Legislative acts)

DIRECTIVES

DIRECTIVE (EU) 2020/2184 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 16 December 2020

on the quality of water intended for human consumption

(recast)

(Text with EEA relevance)

DVGW

PFAS in the DWD [1]

DIRECTIVE (EU) 2020/2184 of 16 December 2020
on the quality of water intended for human consumption (recast)

0,50 µg/l , PFAS Total‘

PFAS Total’ means the totality of per- and polyfluoroalkyl substances

Member States may then decide to use either one or both of the parameters ‘PFAS Total’ or ‘Sum of PFAS’

0,10 µg/l ‚Sum of PFAS‘

Sum of PFAS’ means the sum of per- and polyfluoroalkyl substances considered a concern as regards water intended for human consumption (3 of Part B of Annex III)
This is a subset of ‘PFAS Total’ substances

that contain a perfluoroalkyl moiety with three or more carbons (i.e. –CnF2n–, n ≥ 3) or a perfluoroalkylether moiety with two or more carbons (i. e. –CnF2nOCmF2m–, n and m ≥ 1)

[1] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32020L2184

DVGW

20 single substances for Sum of PFAS (PFAS-20) limit 0,1 µg/l

C-Atome	Carbonsäuren		Sulfonsäuren	
4	Perfluorbutansäure	(PFBA)	Perfluorbutansulfonsäure	(PFBS)
5	Perfluorpentansäure	(PFPeA)	Perfluorpentansulfonsäure	(PFPeS)
6	Perfluorhexansäure	(PFHxA)	**Perfluorhexansulfonsäure**	**(PFHxS)***
7	Perfluorheptansäure	(PFHpA)	Perfluorheptansulfonsäure	(PFHpS)
8	**Perfluoroctansäure**	**(PFOA)***	**Perfluoroctansulfonsäure**	**(PFOS)***
9	**Perfluornonansäure**	**(PFNA)***	Perfluornonansulfonsäure	(PFNS)
10	Perfluordecansäure	(PFDA	Perfluordecansulfonsäure	(PFDS)
11	Perfluorundecansäure	(PFUnDA)	Perfluorundecansulfonsäure	
12	Perfluordodecansäure	(PFDoDA)	Perfluordodecansulfonsäure	
13	Perfluortridecansäure	(PFTrDA	Perfluortridecansulfonsäure	

* 4 PFAS of special concern according to EFSA proposal

European Food Safety Authority

PFAS regulation – additional aspects

- Article 13 → Monitoring, Number 8
  - By **12 January 2024**, the Commission shall establish **technical guidelines** regarding **methods of analysis** for monitoring of … PFAS .. under the parameters ‘PFAS Total’ and ‘Sum of PFAS’, including detection limits, **parametric values and frequency of sampling**

- Article 25 → Transitional period
  - By **12 January 2026**, Member States shall take the measures necessary to ensure that water intended for human consumption complies with the parametric values set out in Part B of Annex I for …. PFAS Total, Sum of PFAS ….
  - **Recommended to do samples much earlier**

DVGW

IWW and other partner will consult DG ENV

- IWW Germany
- TZW Germany
  - Frank Thomas Lange
- University of Copenhagen
  - Xenia Trier
- Örebro University
  - Anna Kärmann

European Commission
DG Environment

No 090202/2023/890359/SER/ENV.C.2

"Support for developing and drafting technical guidelines on PFAS substances under the recast Drinking Water Directive"

German Implementation of European PFAS limits

1) Implementation EU Drinking Water Directive:

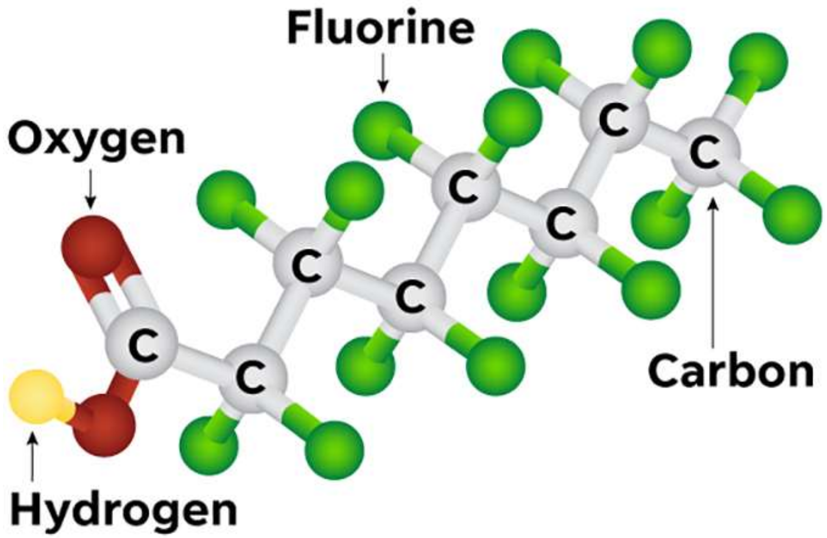
Sum of PFAS-20 = 0,00010 mg/l (≙ **100 ng/l**)
20 defined PFAS substances
Limit value applies from 12.01.2026

2) New national parameter:

Sum of PFAS-4 = 0,000020 mg/l (≙ **20 ng/l**)
PFHxS, PFOS, PFOA und PFNA
Limit value applies from 12.01.2026

3) No adoption

~~**PFAS Total**~~



European Food Safety Authority

DVGW

German Strategy for future Maximimum Values (PFAS-4)?

Maximum Value = Sum of:

1) Toxicologically tolerable
2) Analytically and technically feasible
3) Financeable

20 ng/l?

→ **Step-by-step plan**

2 ng/l?

→ More guidance and health based values for various PFAS expected!

Analytical challenges

Standardisation, performance and problems

CEN Analytical Standard Method for PFAS in freshwaters

Aug. 2022

- prEN 17892 Water quality - Determination of the sum of perfluorinated substances (Sum of PFAS) in drinking water - Method using liquid chromatography/mass spectrometry (LC/MS)

Sep. 2022

- Ring trial with all parameters at low level as first test of method

19 Juni 2023

- **Method validation ring trial**

Dez 2023

- Publication EN 17892 Water quality - Determination of the sum of perfluorinated substances (Sum of PFAS) in drinking water - Method using liquid chromatography/mass spectrometry (LC/MS)

DVGW

Draft of EN available - prEN 17892 June 2023

EUROPÄISCHE NORM

EUROPEAN STANDARD

NORME EUROPÉENNE

ENTWURF
prEN 17892

August 2022

ICS 13.060.50

Deutsche Fassung

Wasserbeschaffenheit - Bestimmung der Summe der perfluorierten Substanzen (Summe der PFAS) im Trinkwasser - Methode mittels Flüssigkeitschromatographie/Massenspektrometrie (LC/MS)

Water quality - Determination of the sum of perfluorinated substances (Sum of PFAS) in drinking water - Method using liquid chromatography/mass spectrometry (LC/MS)

Qualité de l'eau - Détermination de la somme des substances perfluorées (somme des PFAS) dans l'eau potable - Méthode par chromatographie en phase liquide couplée à la spectrométrie de masse (CL/SM)

DVGW

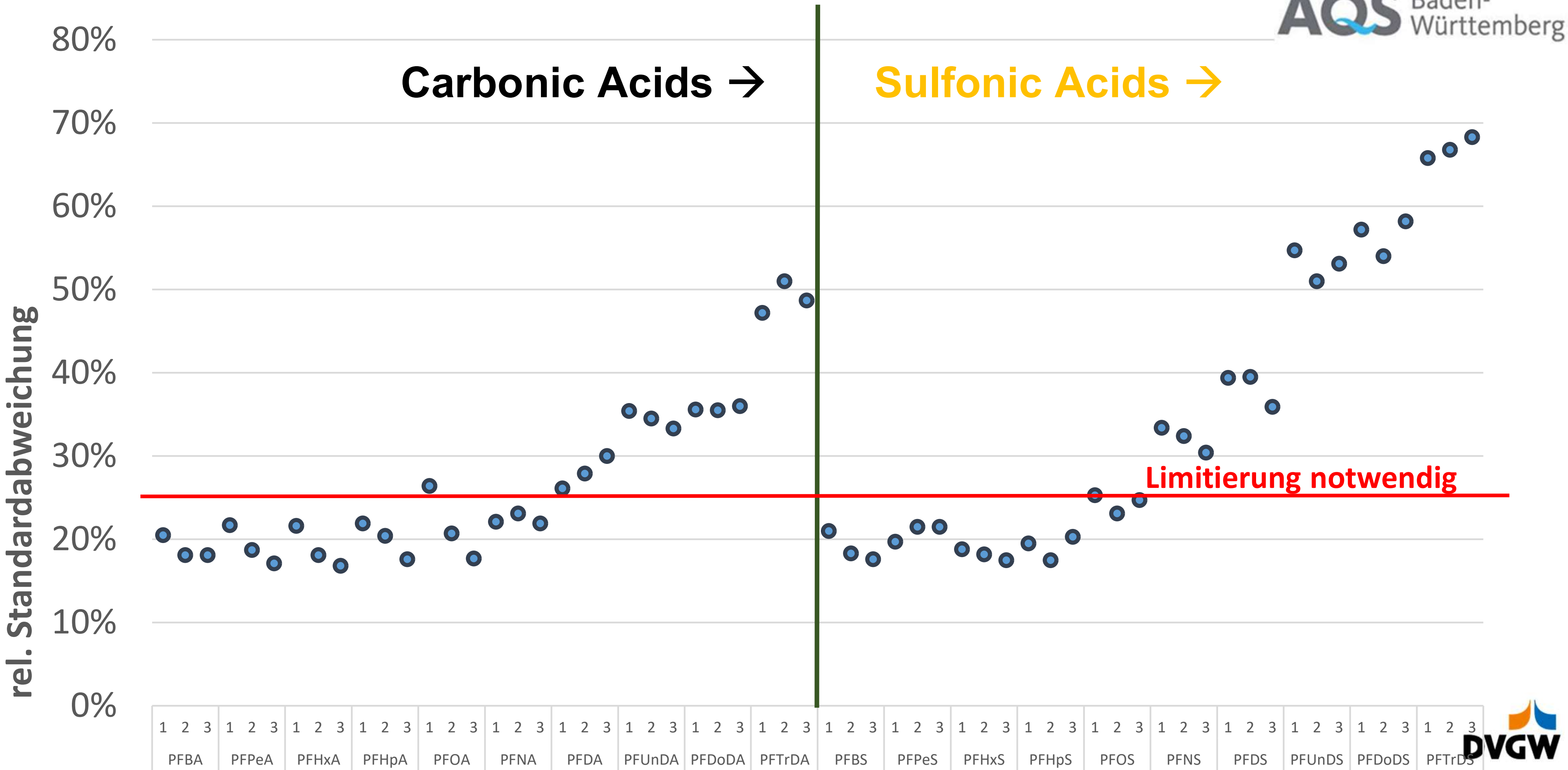
prEN 17892 – Scope

- For many substances, a limit of quantification (LOQ) of **1 ng/l** can be achieved
- For large volume injection techniques or with SPE, lower LOQs possible
  - Optimum/maximum **0,2 ng/l**
- Achievable LOQs very much depend on (lab) **blank values**
- Analytical limitations
  - for short-chain PFAS (polarity)
  - PFAS with more than ten carbon atoms (adsorption)

Performance requirements

- PFAS-20 and PFAS-4
  - Measurement Uncertainty **50 %**
    - per individual substance at 5 ng/l level of the 20 compounds
  - Limit of determination **(LOQ) 1,5 ng/l** or lower for each individual substance

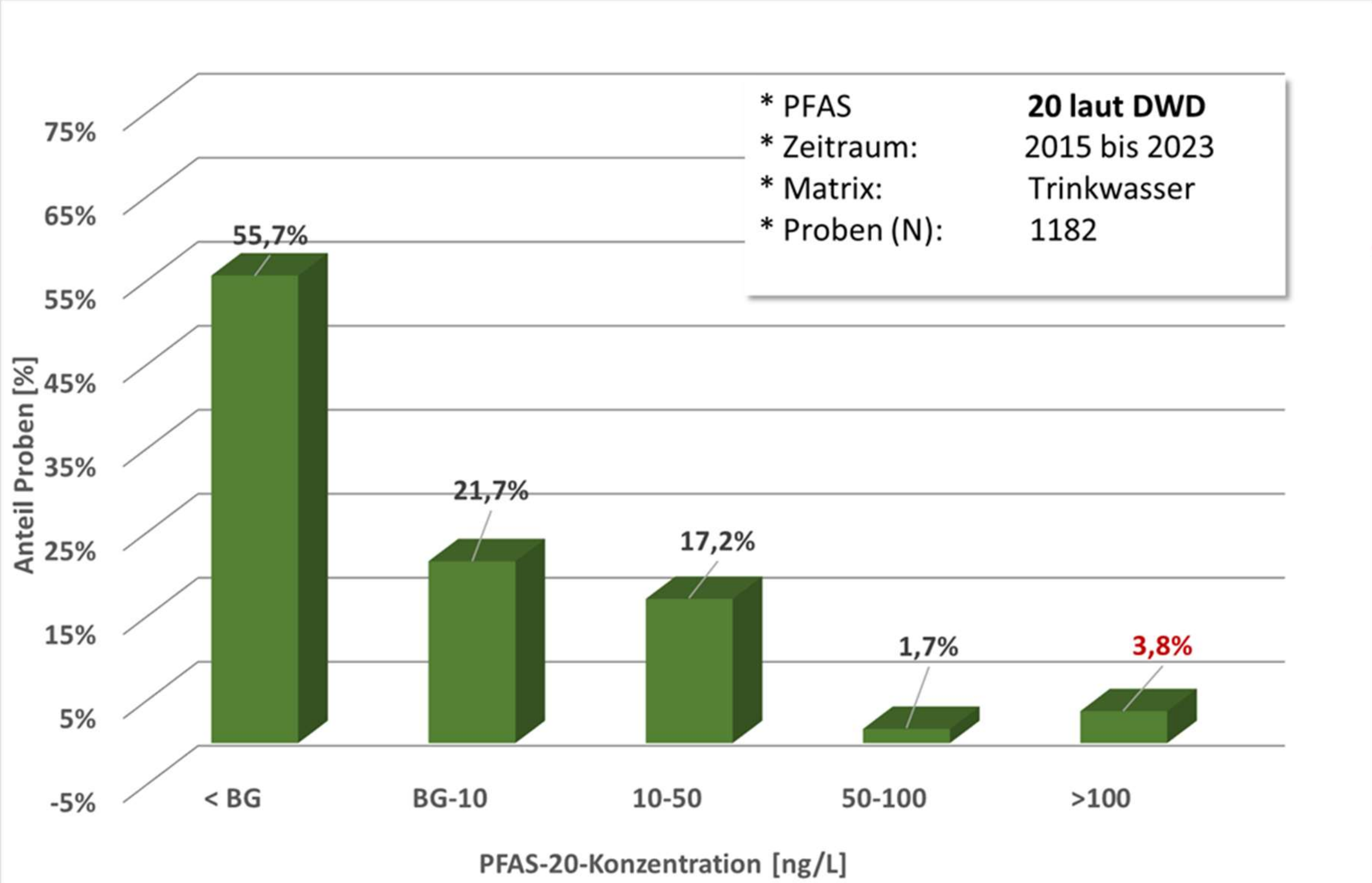
Standard deviations highlight the adsorption problem



Findings in German drinking waters

What actually occurs?

PFAS in German Drinkingwater : PFAS-20 > 0,1 µg/L



Umwelt Bundesamt

Bayerisches Landesamt für Gesundheit und Lebensmittelsicherheit

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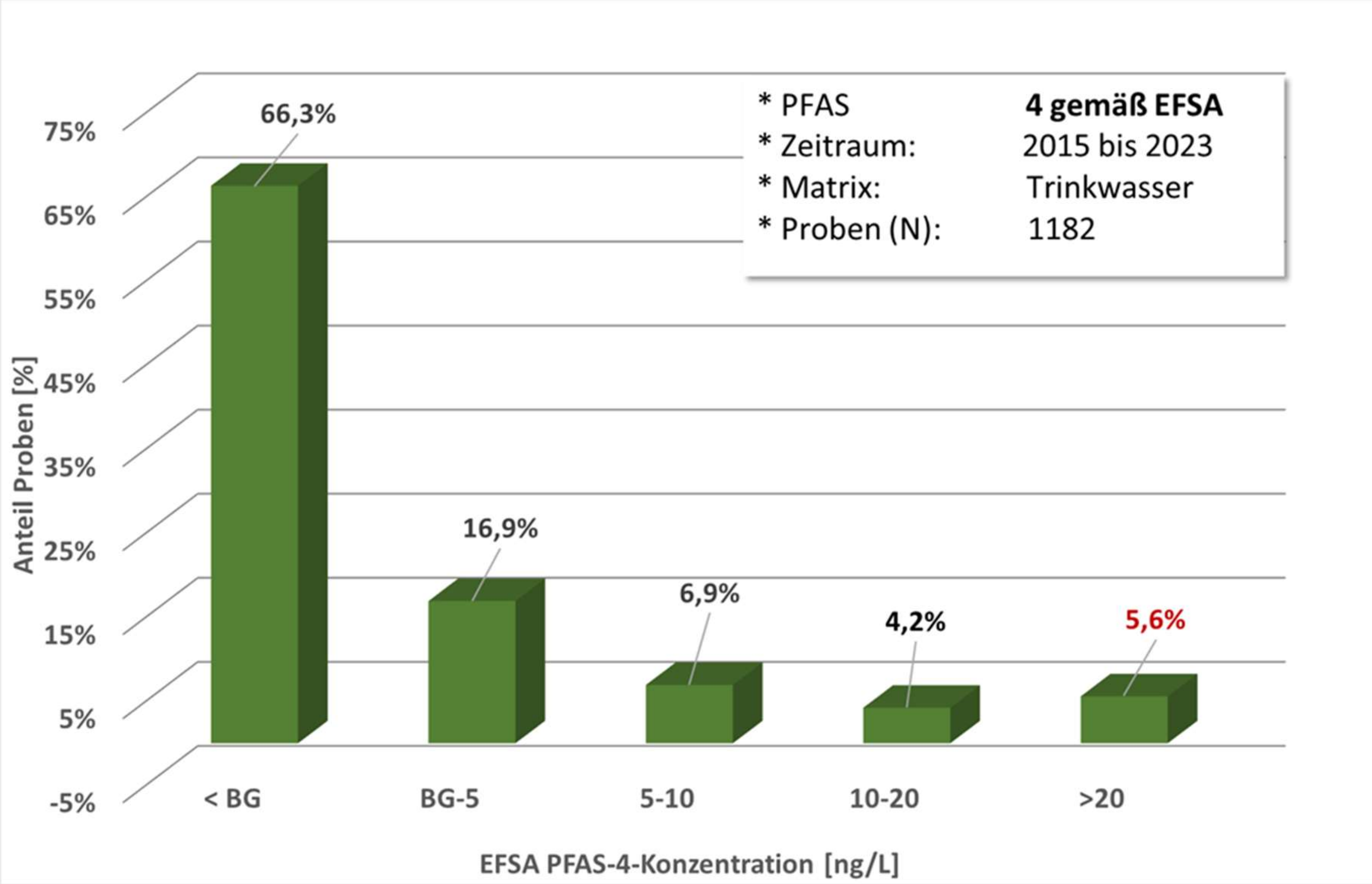
PFAS in German Drinkingwater: **PFAS-4 > 0,020 µg/L**



Umwelt Bundesamt

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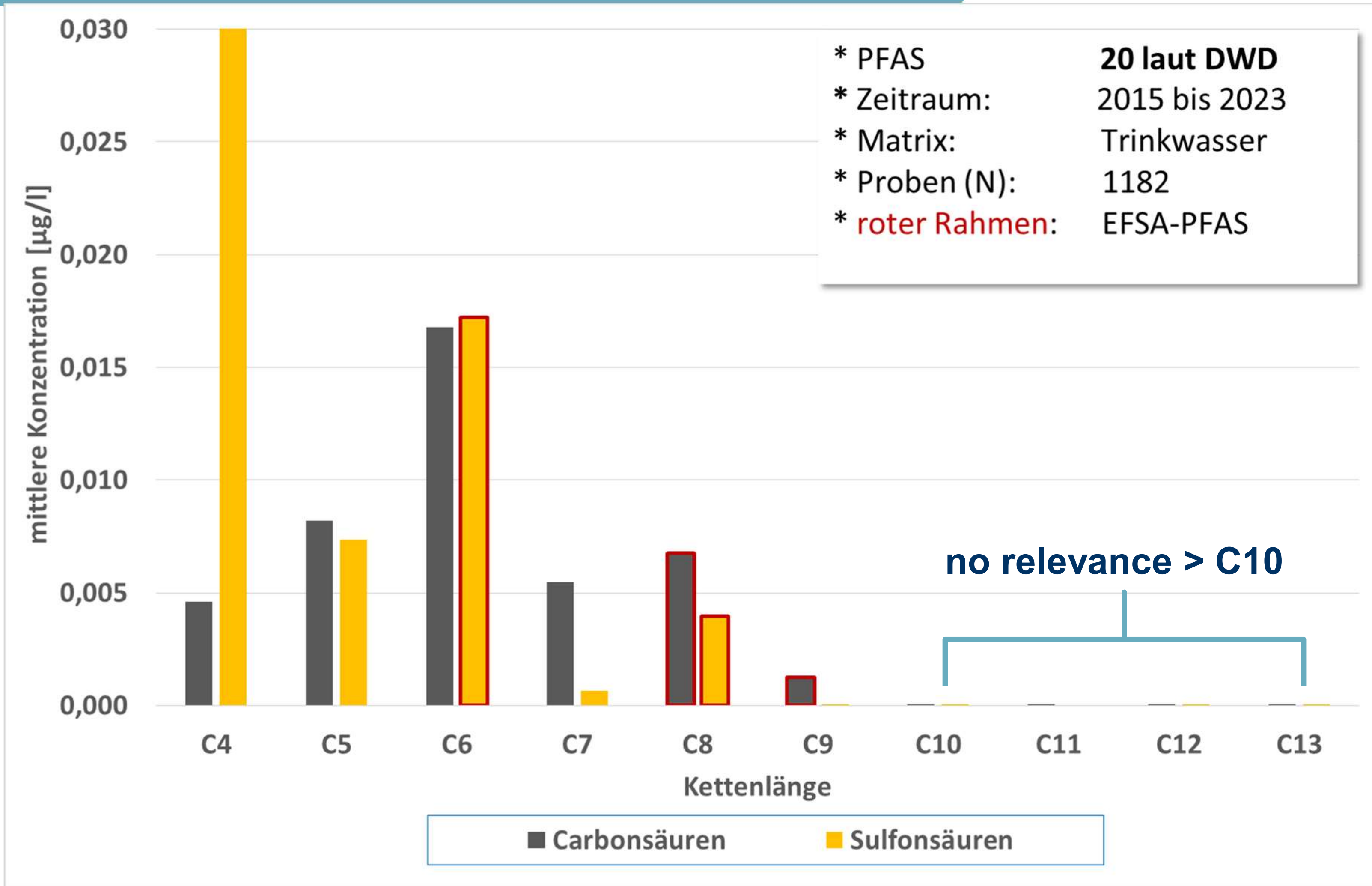
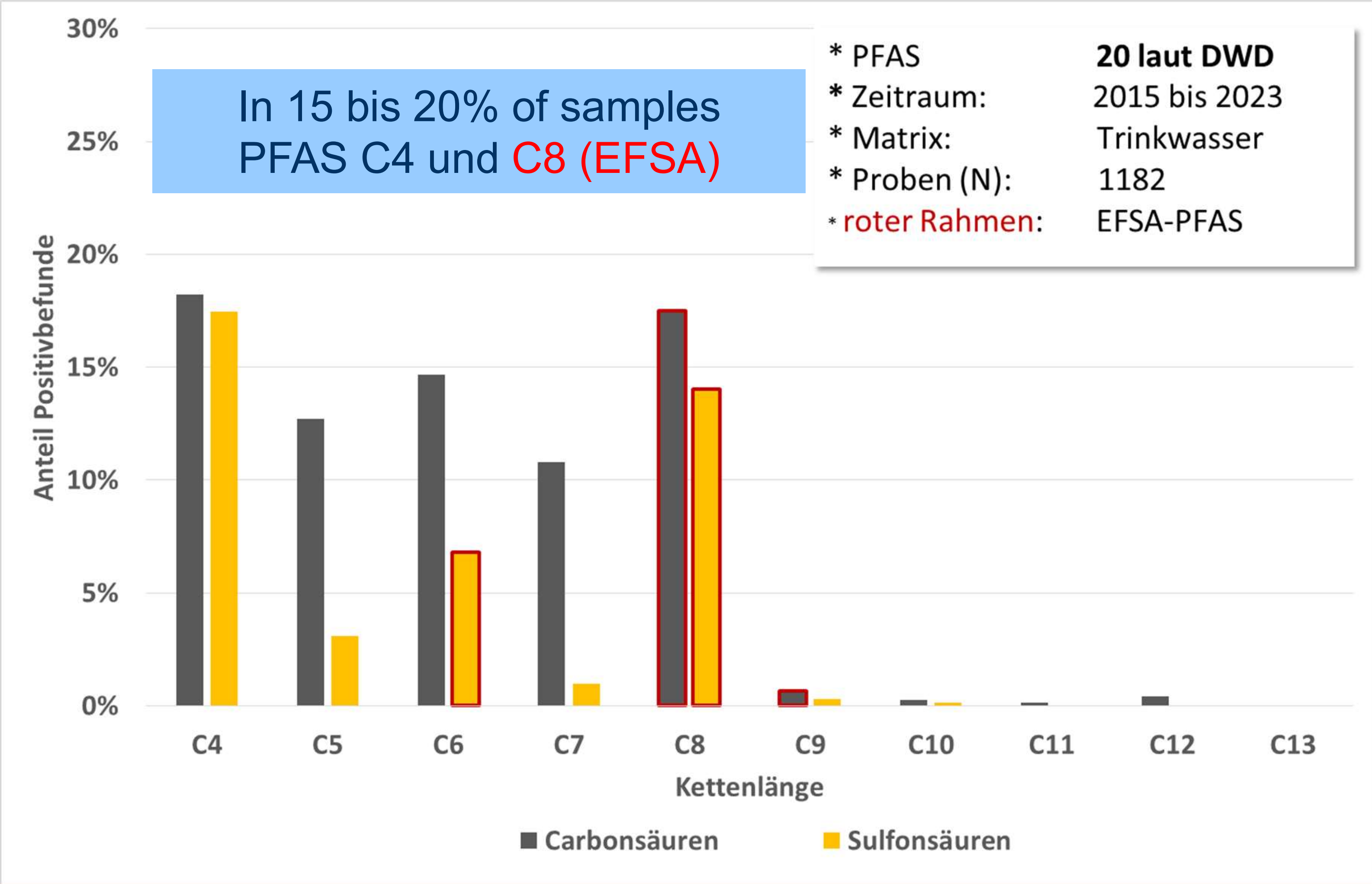
Concentration distribution PFAS according to chain length



Frequency distribution PFAS according to chain length



Umwelt Bundesamt

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PFAS: Treatment Options

- **Unsuitable Processes**
  - **Subsoil passage/soil filtration**
  - **Aeration**
  - **Flocculation**
  - **Deferrization/Demanganization**
  - **Sand filtration/ultrafiltration**
  - **Oxidation (ozone, potassium permanganate, ...)**
  - **Disinfection (chemical, UV)**

- **Effective processes**
  - **Adsorption (activated carbon, ion exchanger)**
  - **Membrane filtration (NF/UO)**

Quelle: IWW

DVGW

Many thanks!

Dr. Ulrich Borchers

u.borchers@iww-online.de

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IWW ZENTRUM WASSER

DVGW

Pharmaceuticals in the environment

Pharmaceuticals in the environment
- The global perspective

Tim aus der Beek (IWW Water Centre)

ZeroPM webinar

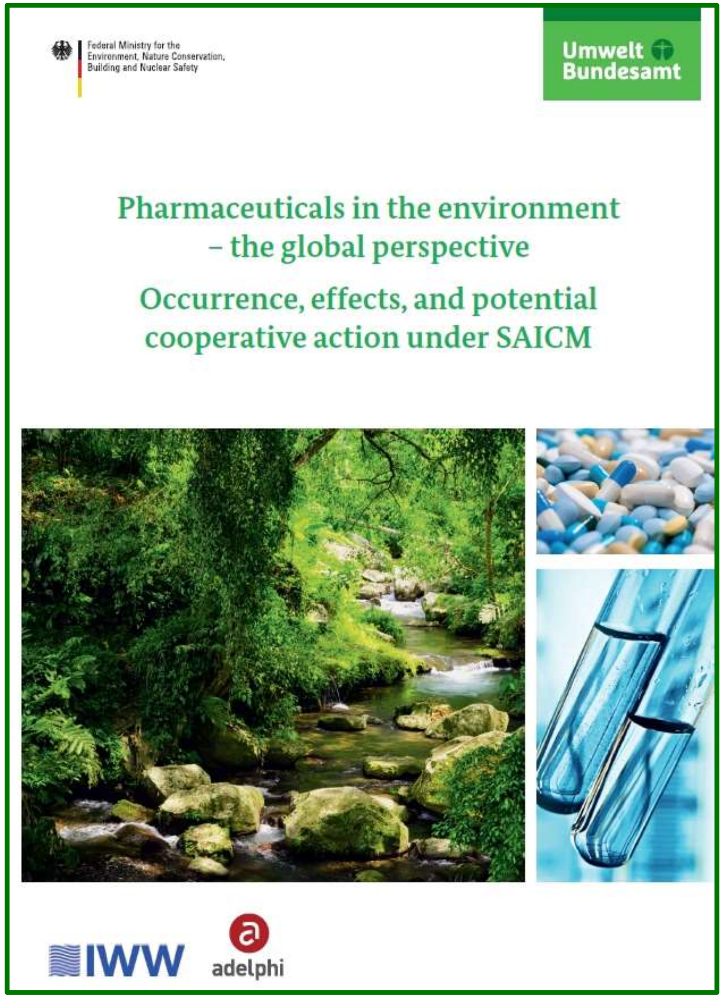
'Protecting drinking water sources from persistent and mobile substances'

19th June 2023

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101036756

Motivation

- Gather evidence that pharmaceuticals in the environment are a global problem
- Set up a permanent and updated database on globally measured environmental concentrations of pharmaceuticals
- Derive measures that can mitigate the occurrences of pharmaceuticals in the environment
- Convince UNEP to integrate them as emerging pollutants in UNEP-SAICM (www.saicm.org).



Literature Compilation

Endnote© database:

- **2062 publications reporting pharmaceuticals in various countries (as data source, version 3)**
- **Publications collected by**
  - **Database search** (ISI Web of Knowledge™, library catalogues, etc.)
  - **Internet**
  - **Contacting of stakeholders**
  - **Research projects**
- **Types of publication**
  - **Mostly English-language scientific papers**
  - **Relative little governmental reports**
  - **German-, Chinese-, French-, Russian-, Slovenian-, Portuguese-, Dutch-, Swedish- and Spanish-language publications evaluated**

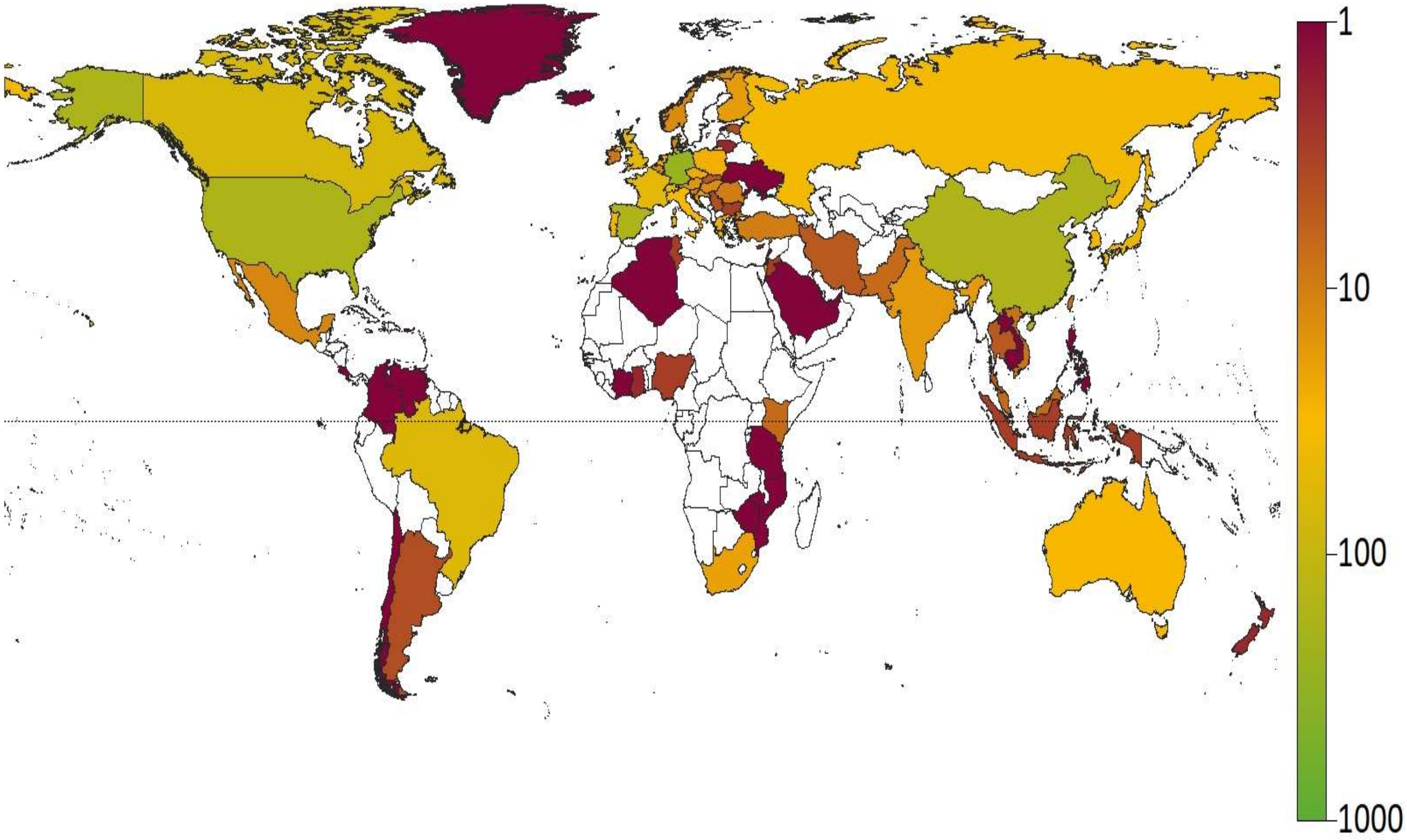
MEC Database (measured environmental concentrations)

The PHARMS-UBA v3 database in numbers - global, for the European Union and for Germany - compared to v2

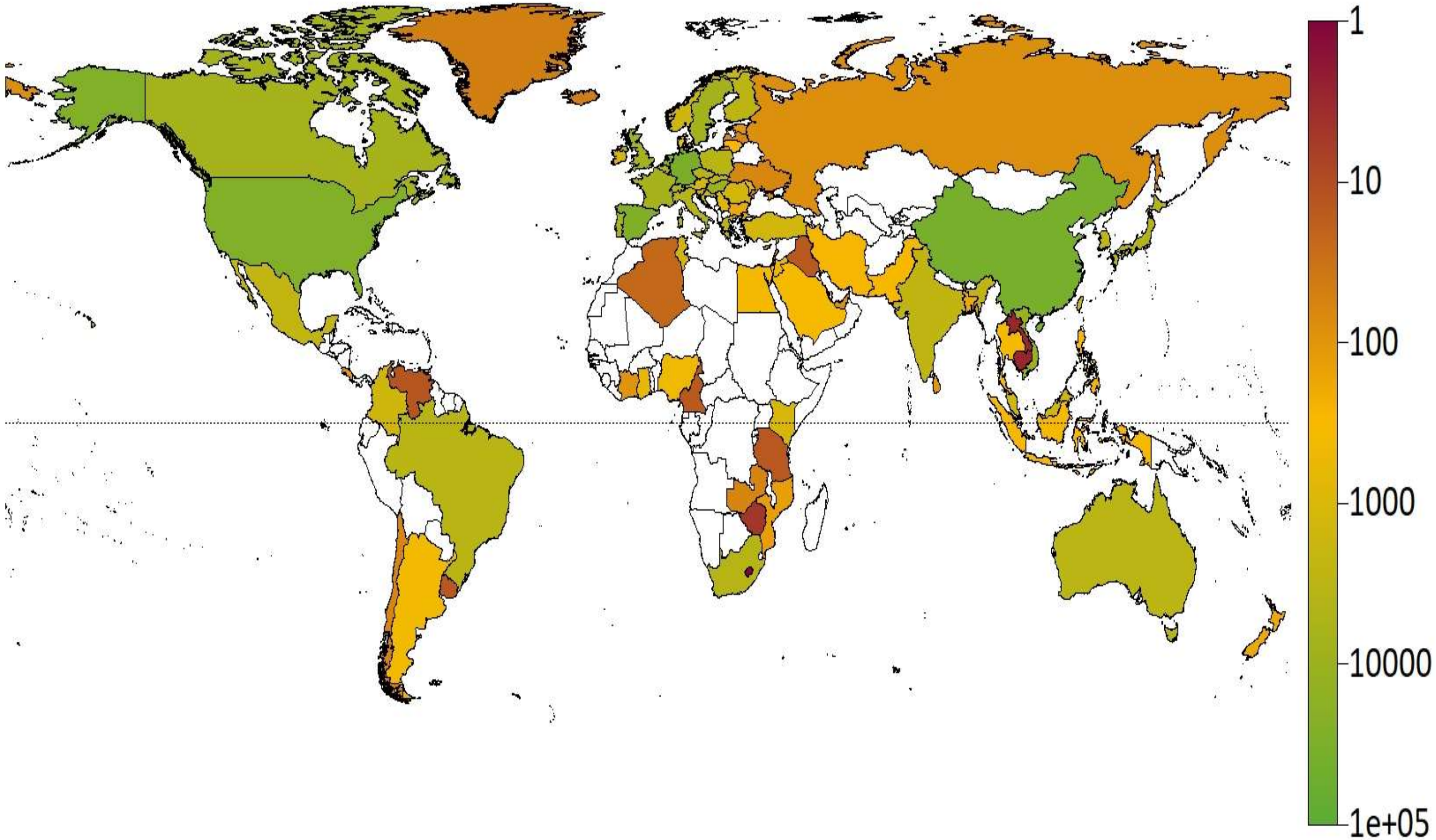
Number of	Global		European Union		Germany	
Publications	**2.062**	**+ 543**	**940**	**+ 167**	**295**	**+ 24**
from countries	**89**	**+ 10**	**28**	**+ 1**	**1**	**-**
MECs	**276.895**	**+ 98.246**	**151.633**	**+ 43.005**	**34.001**	**+ 9.987**
Positively detected MECs	**121.252**	**+ 44.562**	**61.618**	**+ 18.474**	**17.693**	**+ 7.455**
Liquid emission (WWTP effluent/ sewages/reclaimed water)	32.561	+ 8247	19.018	+ 4.012	3.011	+ 928
Liquid-immission (surface water/bank filtrate/groundwater/drinking and tap water)	49.118	+ 19..718	24.426	+ 6.884	7.540	+ 1.119
Solid-emission (manure/dung/sediment from aquaculture/SPM/biosolids/sludge)	4.629	+ 546	2.061	+ 253	180	0
Solid-immission (sediment/soil/SPM)	9.522	+ 6.759	6.248	+ 5.493	5.414	+ 5.280
Positively detected substances	**992**	**+ 221**	**749**	**+ 153**	**414**	**+ 145**
Liquid emission (WWTP effluent/ sewages/reclaimed water)	771	+ 158	591	+ 117	339	+ 123
Liquid-immission (surface water/bank filtrate/groundwater/drinking and tap water)	703	+ 175	483	+ 99	198	+ 39
Solid-emission (manure/dung/sediment from aquaculture/SPM/biosolids/sludge)	337	+ 192	250	+166	39	+ 22
Solid-immission (sediment/soil/SPM)	295	+ 111	227	+95	120	+ 96

MECs with no or wrong units were not considered during counting of MECs.

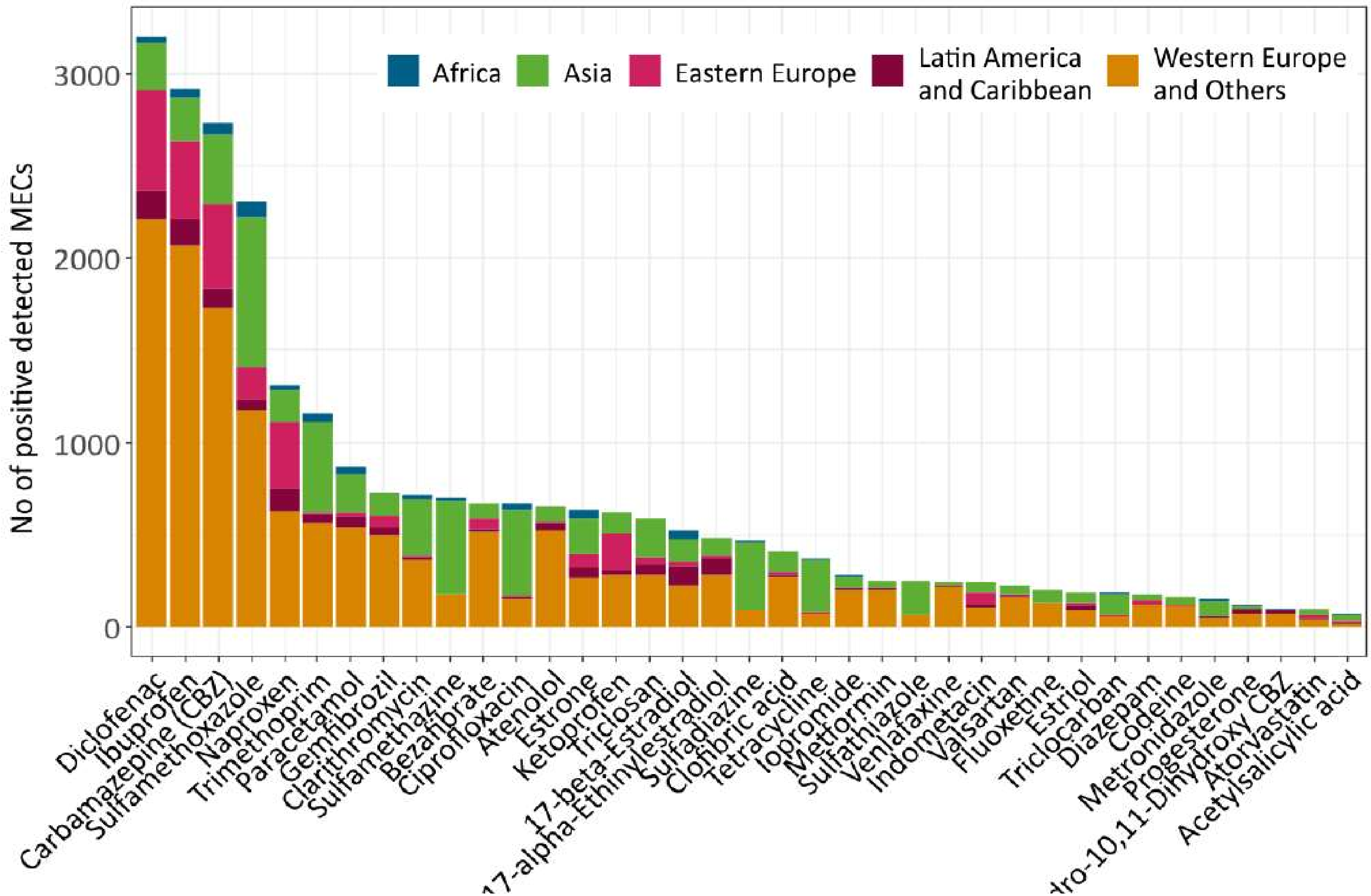
Number of publications reporting MECs (v3)



Number of MECs per country (v3)

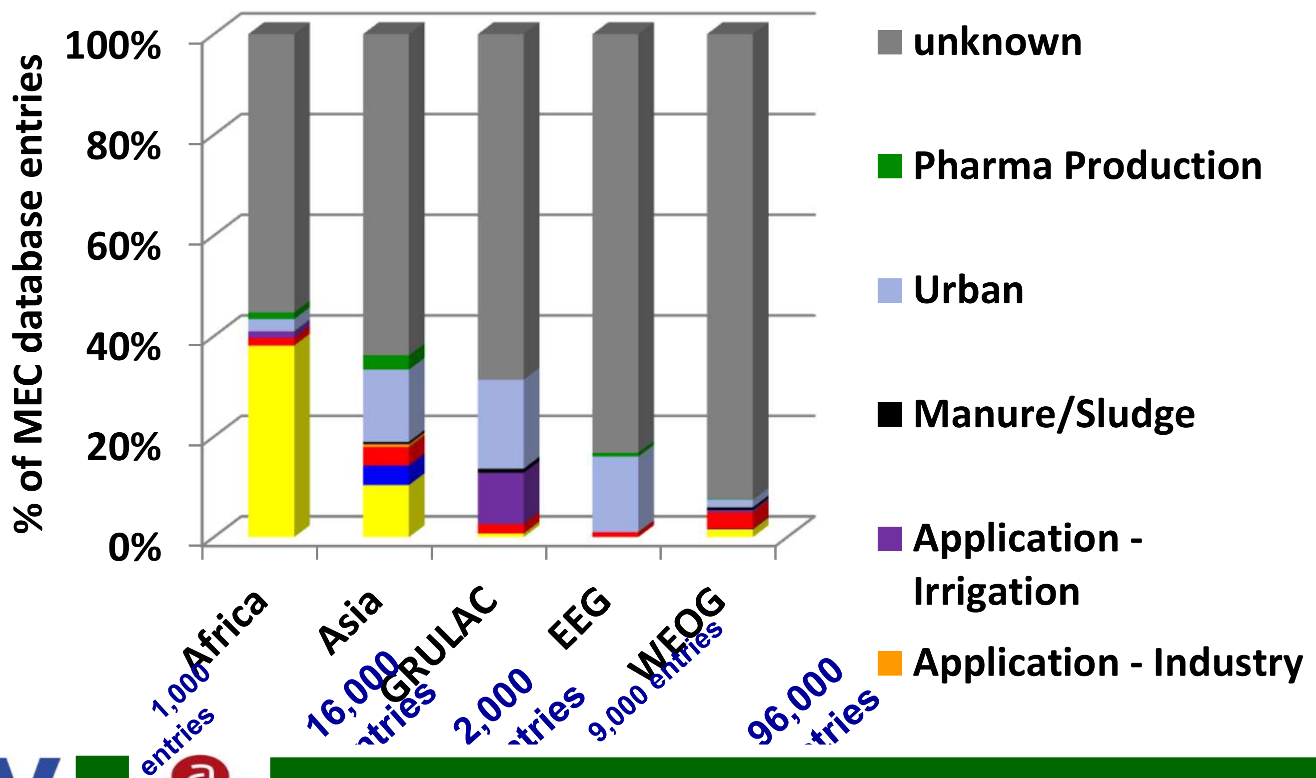


Most often detected pharmaceuticals (v3)



Sources of pharmaceutical MECs (v1)

- Urban areas are a major contributor.
- Discharge from manufacturing, animal husbandry, and aquaculture are important regionally.



Effects of human medicines in the environment –case studies

17α-Ethinylestradiol
Synthetic estrogen
Fathead minnow (*Pimephales promelas*)
Population collapse due to feminization of male fish
Whole-lake experiment
Kidd et al. 2007

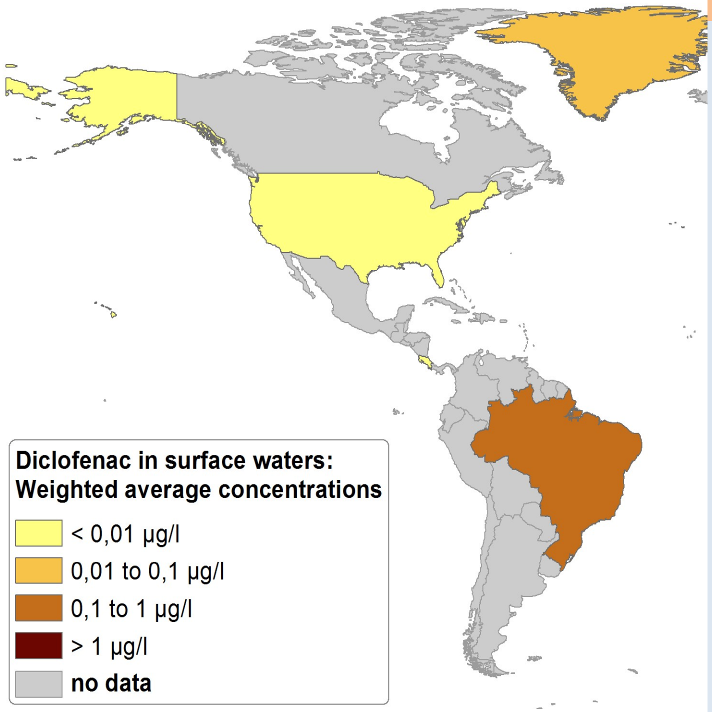
Fluoxetine
Antidepressant
Leopard Frog (*Rana pipiens*)
Delayed tadpole development
Laboratory
Foster et al. 2010

Enrofloxacin, Ciprofloxacin
Antibiotics
Cyanobacterium (*Anabaena flosaquae*) Duckweed (*Lemna minor*)
Growth inhibition
Laboratory
Ebert et al. 2011

Global occurrences of Diclofenac (v1)

Average Diclofenac concentration in surface waters

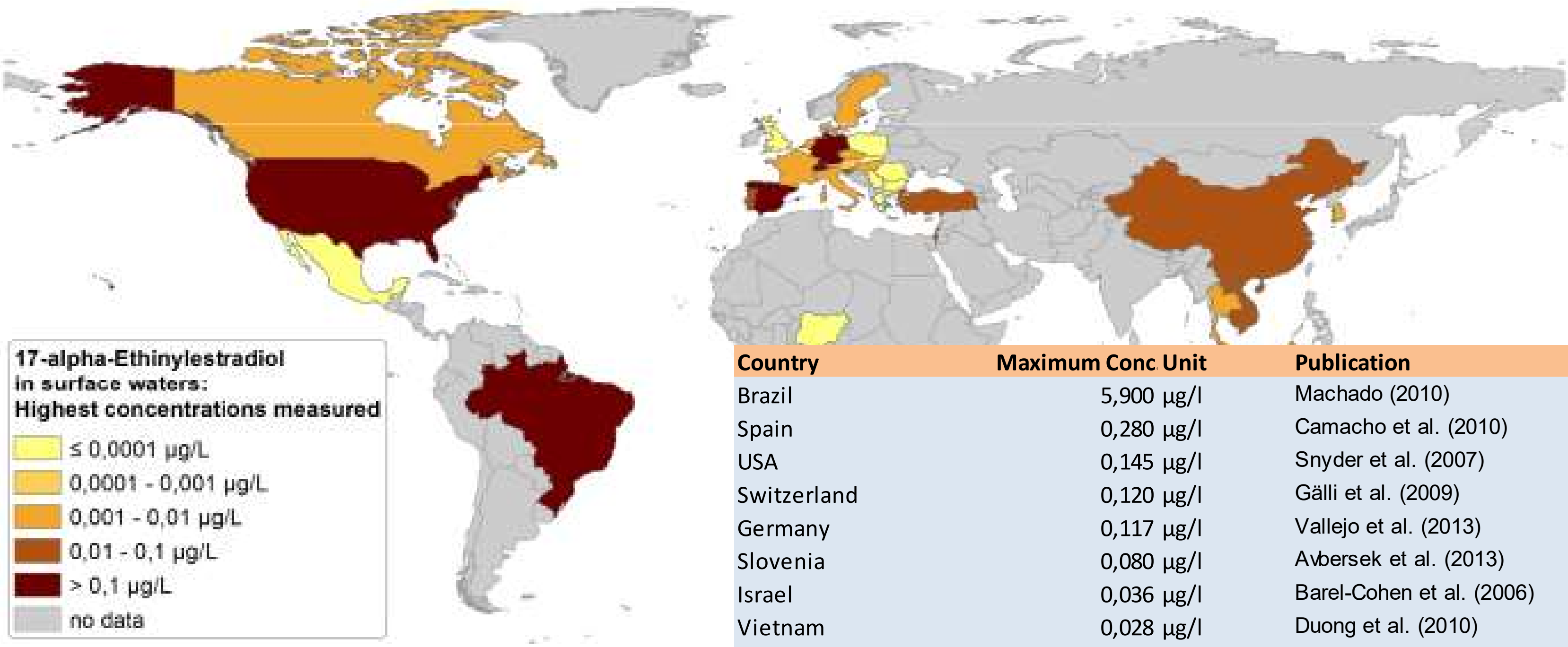
(all countries in table are exceeding PNEC of 0.05 µg/l)



Country	Average (weighted)	Unit	Samples (n)
Pakistan	1,550	µg/l	8
Brazil	0,707	µg/l	44
Côte d'Ivoire	0,540	µg/l	6
Ukraine	0,438	µg/l	8
Spain	0,268	µg/l	204
Czech Republic	0,200	µg/l	68
Germany	0,164	µg/l	4137
Slovakia	0,152	µg/l	134
Poland	0,126	µg/l	40
Malaysia	0,117	µg/l	2
Greece	0,104	µg/l	25
Belgium	0,103	µg/l	14
Sweden	0,090	µg/l	113
Cyprus	0,088	µg/l	2
South Africa	0,085	µg/l	2
Switzerland	0,077	µg/l	183
…	…	…	…

Global occurrences of Ethinylestradiol (v1)

- **Maximum 17-α-Ethinylestradiol (EE2, birth control pill) concentrations in surface waters** (all countries in table are exceeding PNEC of 0.035 ng/l)



Country	Maximum Conc.	Unit	Publication
Brazil	5,900	µg/l	Machado (2010)
Spain	0,280	µg/l	Camacho et al. (2010)
USA	0,145	µg/l	Snyder et al. (2007)
Switzerland	0,120	µg/l	Gälli et al. (2009)
Germany	0,117	µg/l	Vallejo et al. (2013)
Slovenia	0,080	µg/l	Avbersek et al. (2013)
Israel	0,036	µg/l	Barel-Cohen et al. (2006)
Vietnam	0,028	µg/l	Duong et al. (2010)
China	0,027	µg/l	Chen et al. (2007)
…	…	…	…

Conclusions

- Pharmaceuticals occur globally in the environment (not just in industrialized countries):
  - Detected in 98 countries covering all 5 UN regional groups
  - Data availability for emerging and developing countries increasing, but still lower than in western countries
- In most countries, certain pharmaceuticals prevail at concentrations above PNEC in surface waters, suggesting adverse ecotoxicological effects in these locations.
- Urban wastewater discharge is the dominant emission pathway, while discharge from manufacturing, animal husbandry and aquaculture are important regionally.
- UNEP successfully integrated pharmaceuticals as emerging pollutants in SAICM, offering global outreach and funds.
- The database is regularly updated and online available for free.

www.pharmaceuticals-in-the-environment.org

- **The database, report ,and materials is available at https://www.umweltbundesamt.de/en/database-pharmaceuticals-in-the-environment-figures-0**

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PHARMACEUTICALS IN THE ENVIRONMENT—GLOBAL OCCURRENCES AND PERSPECTIVES

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(Submitted 27 February 2015; Returned for Revision 3 July 2015; Accepted 11 December 2015)

Abstract: Pharmaceuticals are known to occur widely in the environment of industrialized countries. In developing countries, more monitoring results have recently become available, but a concise picture of measured environmental concentrations (MECs) is still elusive. Through a comprehensive literature review of 1016 original publications and 150 review articles, the authors collected MECs for human and veterinary pharmaceutical substances reported worldwide in surface water, groundwater, tap/drinking water, manure, soil, and other environmental matrices in a comprehensive database. Due to the heterogeneity of the data sources, a simplified data quality assessment was conducted. The database reveals that pharmaceuticals or their transformation products have been detected in the

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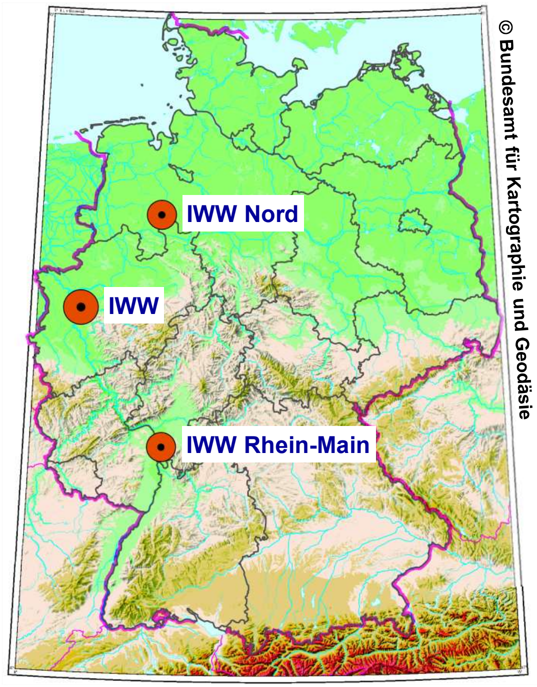

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