REGIONAL EXPOSURE ASSESSMENT OF METALS IN THE AQUATIC FRESHWATER ENVIRONMENT

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Introduction

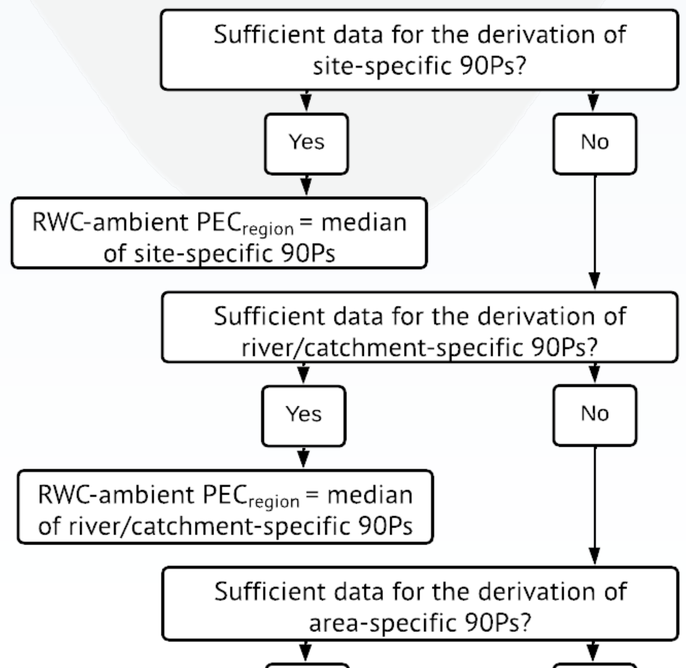
Environmental release rates of metals are expected to vary over time as new applications are found and manufactured volumes change. Additionally, improvement of emission-reducing technologies and external conditions like climate change may further contribute to the change. As a consequence, previously collected regional ambient concentration levels that were used in a regulatory context may no longer be relevant for current or future situations.
The update of regional metal concentration levels in the aquatic environment is part of Eurometaux's currently ongoing comprehensive "Metals environmental exposure gathering program" (MEED-program). The program accounts for both current and anticipated future requirements to comply with the Zero Pollution Ambition and biodiversity objectives.

Materials and Methods

Data sources

I. *WATERBASE – period 2017-2021:* European Environmental Agency (EEA) database on the status and quality of waters in Europe. Data within Waterbase have been submitted by member states – undergoing quality control by EEA.

II. Data from individual countries:
- **Sweden**: https://miljodata.slu.se/MVM/Search
- **Finland:** https://www.syke.fi/fi-FI/Avoin_tieto /Ymparistotietojarjestelmat/
- Rekisteroityminen (Finnish Environment Institute**)**
- Additional information for **The Netherlands** (RWS) has been identified – data processing is currently ongoing.



Approx. **1.000.000 data points**, >3000 distributions. ➡ Measurements grouped per site, river or area.
Reasonable worst case (RWC) ambient PEC$_{country}$ = median of 90th percentile of all grouped measurements.

Results and Discussions

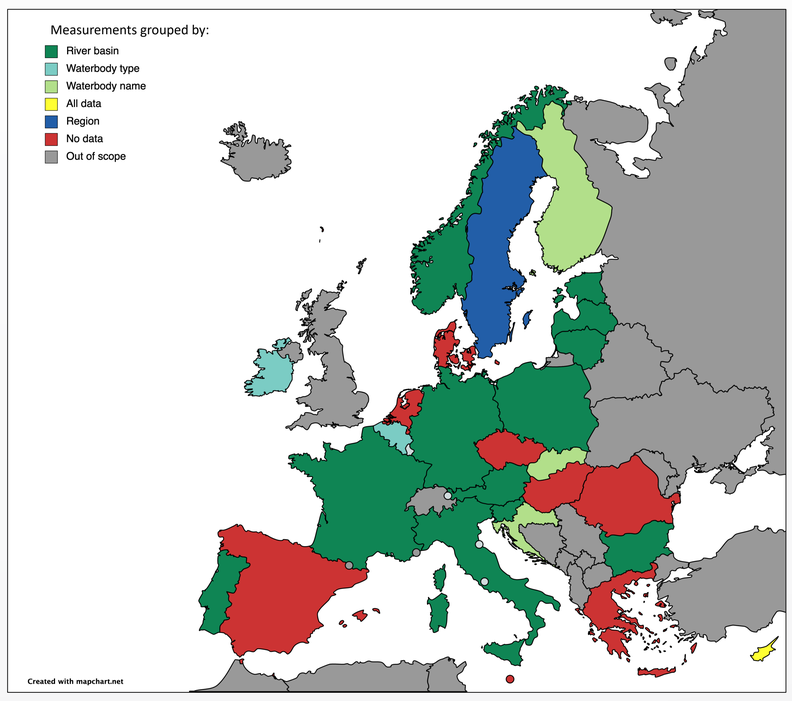


Figure 1: Chosen type of measurement grouping per country

Table 1: Calculated RWC-ambient PEC$_{country}$ (in µg metal$_{dissolved}$/L)

Country	Al	Sb	As	B	Cd	Cr	Co	Cu	Fe	Pb	Mn	Hg	Mo	Ni	Se	Ag	Ti	W	V	Zn
Austria	350		0,5		0,05	0,5		0,5	400	0,5	34,6	0,025		0,5	0,5					2,5
Belgium		1,2	2,658	177,9	0,1	1,5	0,8834	2,131	88,25	0,5	148,9	0,02	4,297	4,15	0,65	0,17	2		2,995	17
Bulgaria	74		2,709		0,025	1,431		5,643	61,570	1,217	51,5	0,0122		2,280						27,82
Cyprus			0,5	85,8	0,025	2,5		2,5	8,6	0,772	5	0,01		2,03	1,3					9,567
Germany					0,0162					0,18		0,005		2,33	0,5	0,01				
Estonia	25		94		0,01	0,25	0,11	720,5	876,4	0,122	110	0,0075		0,906						
Spain	66030	0,05	19,67			60	0,05	36,97	33567	22,72		260	0,05	27,50	1760				0,23	290,8
Finland	260		0,855		0,034		0,659	1,95	1200	0,324				3,36						14,4
France	214,7		2,03		0,016	0,5	0,349	1,6	221,6	0,3	54,26	0,005	1,484	1,4	0,25		7,02		2,466	12,34
Croatia	21551		1,232		0,0378	0,46		1,672	28,92	0,3109	5,497	0,0056		1,653						6,243
Ireland	89,4	0,5	0,5	14	0,02	0,5	0,5	2,25	296	0,5	43,7	0,01	0,5	1,7	0,5				0,5	8,82
Italy	49,2	1	2	245	0,0609	2	0,5	5	58,82	0,5	47,87	0,05	4,034	3,1	1	1		79,8	2,5	18
Lithuania	49,2		1		0,05	0,549		2,509		0,5		0,005		1,6					1,24	7,5
Latvia			1,353		0,0385	0,4		2,492		1,882		0,0535		1						3,65
Norway	84,4	0,1	0,161	161,6	0,02	0,218	0,554	0,802	87,6	0,13	2,6	0,00161	0,348	0,502		0,002			0,1312	2,82
Poland	65,3	0,3	5	35,36	0,0548	2,50	1	3,6	1617	0,387	89,3	0,01	5	1,969	2,5		5,431		5	13,44
Portugal		0,5	2,545		0,0735	1		3,446		0,5		0,0192		2,919						16,28
Sweden	376,2	0,131	0,57		0,039	0,56	0,45	2,01	1243,8	0,68	101,3	0,00336	0,67	1,41					0,91	7,76
Slovenia		0,104	0,883	17,32	0,012	0,303	0,0852	0,972		0,108		0,005	0,509	1,033	0,217					2754
Slovakia			2,485		0,0379	1,683		2,802		1,05		0,0075		2,2						10,81

Outliers
LOQ

Outlier analysis according to: log(Xi) > log (p75) + K(log(p75) – log(p25)) With *Xi = measured concentration and K = 1,5 (scaling factor)*
Pragmatic approach: removal of outliers > cut-off value is only considered when 75th percentile > relevant reported LOQ/2.

Comparing calculated RWC-ambient PEC with FOREGS database

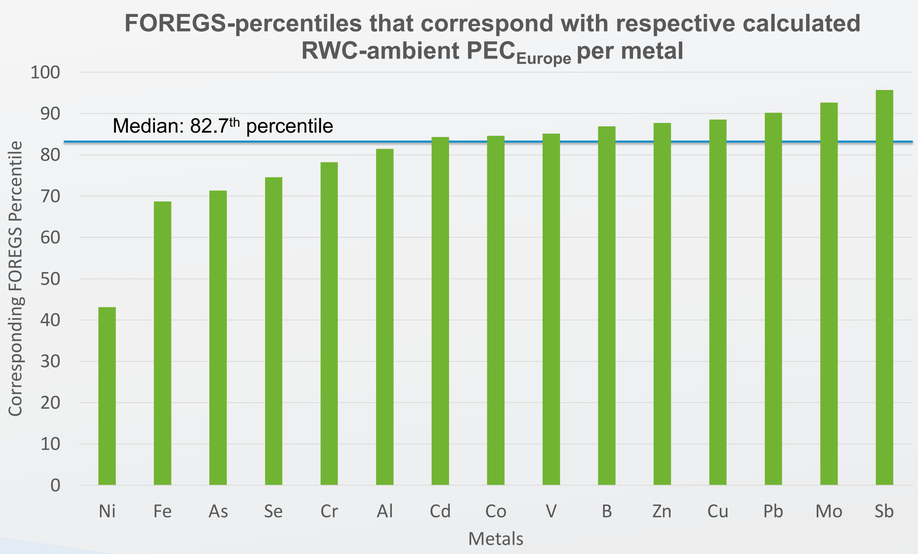


Figure 2: Comparing the ambient PEC$_{regional}$ of data-rich metals with their respective FOREGS-percentile

The 82,7th percentile of FOREGS data can be used to estimate a default EU ambient PEC$_{regional}$ for metals that have limited measurements (<5 countries reporting data).

Table 2: FOREGS derived EU ambient PEC$_{regional}$ for data poor metals

Metal	Default PEC$_{regional}$ (µg/L)
Ag	0,004
Ge	0,016
In	0,001
Sb	0,159
Te	0,009
Ti	2,300
V	1,139
W	0,021

Conclusions

- Over the last decade monitoring data have been made available for more countries, thus increasing the relevance/reliability of the ambient PEC$_{regional}$;
- Using the updated ambient PEC$_{regional}$ will improve the quality of the regional exposure assessment and exposure scenarios in which they are applied;
- No down/upward temporal changes of metal concentration levels were noted for the 2017-2021 period (data not shown);
- The 82,7th percentile of FOREGS is proposed as alternative for the ambient PEC$_{regional}$ for data-poor metals.