EU-WIDE EXPOSURE ASSESSMENT OF METALS IN MUNICIPAL SEWAGE TREATMENT PLANTS

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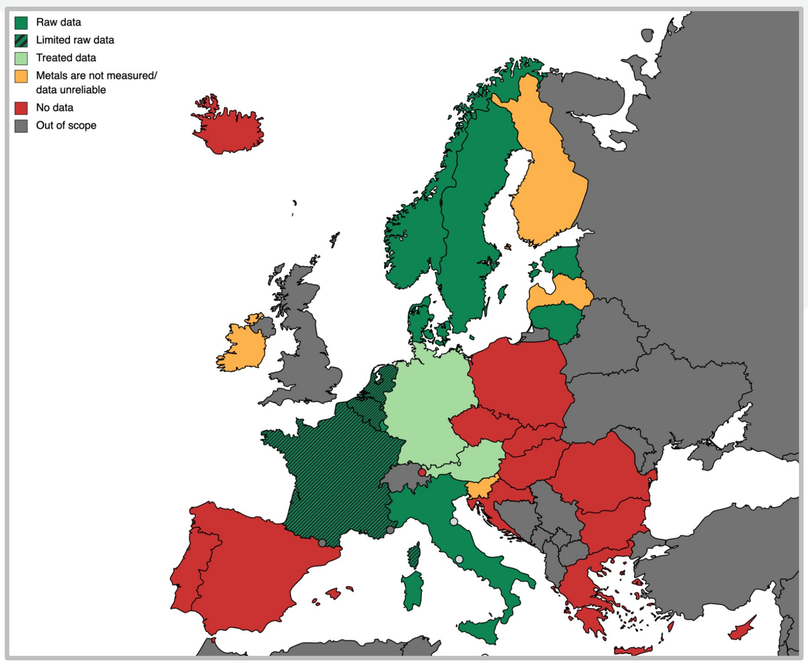
Introduction

Estimations of consumer and professional releases of metals to the aquatic environment due to widespread uses in the REACH dossiers are often based on default assumptions and hence lead to very precautionary assessments. One way to **improve the estimation of the collective contribution** of these sources is the **assessment of inflows and emissions via municipal sewage treatment plants (STP)**, given they collect metal emissions from all combined sources. Around 80-90% of urban wastewater is collected and treated in the EU, hence metal emissions through STP effluent are not to be neglected. **Providing an improved estimate of metal concentrations present in the effluent of municipal sewage treatment is part of Eurometaux's comprehensive "Metals Environmental Exposure Data gathering program" (MEED-program), covering today's and expected needs for tomorrow to comply with the Zero Pollution Ambition and biodiversity objectives.**

Outcome of the data collection



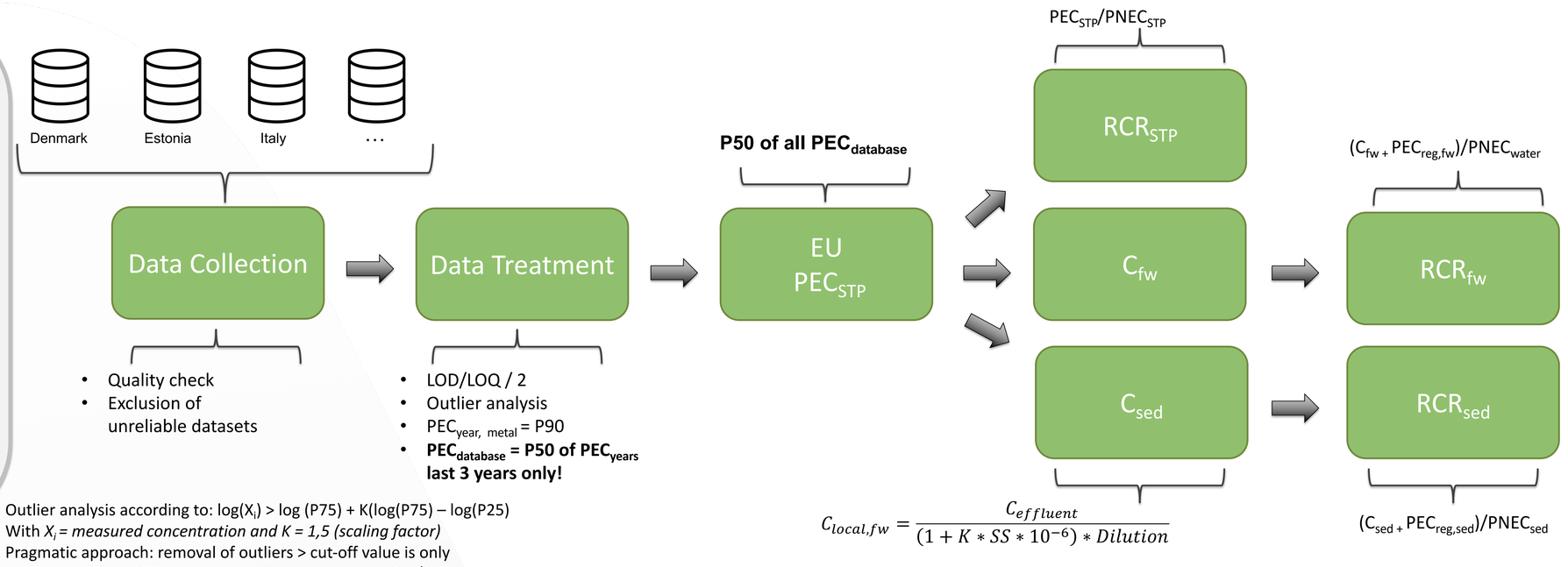
Methodology

Data gathering

The challenge
- No single EU monitoring database

The solution
- Websites of environmental agencies and public water agencies for all EU countries investigated
- Filled contact forms or sent emails to more than 100 contacts

The outcome
- Data received for 14 countries
  - ➢ Not all was useful
  - ➢ High quality and format variation

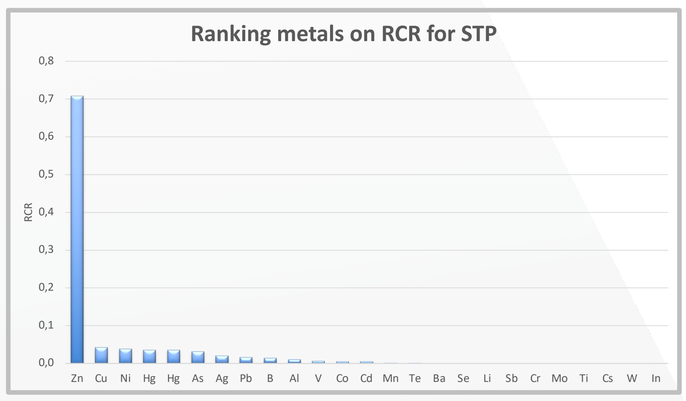


Outlier analysis according to: $\log(X_i) > \log(P75) + K(\log(P75) - \log(P25))$
With X_i = *measured concentration and K = 1,5 (scaling factor)*
Pragmatic approach: removal of outliers > cut-off value is only considered when P75 percentile > relevant reported LOQ/2.

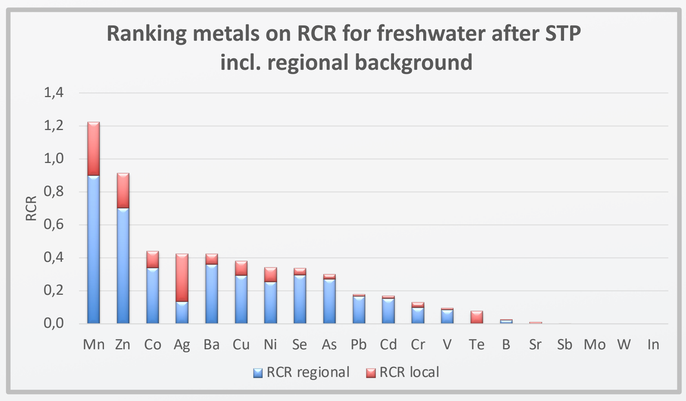
$$C_{local,fw} = \frac{C_{effluent}}{(1 + K * SS * 10^{-6}) * Dilution}$$

Results

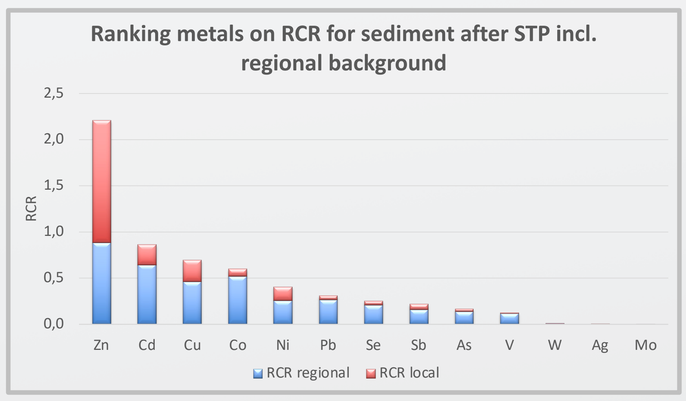
Metal	Number of countries	PEC_{STP} (µg/L)	$PNEC_{STP}$ (µg/L)	RCR_{STP}
Ag	4	0.5	25	**0.020**
Al	6	207	20000	**0.010**
As	10	1.91	61	**0.031**
B	6	138	10000	**0.014**
Ba	7	74.88	62200	**1.20×10^{-3}**
Be	3	0.11	NA	**NA**
Co	6	1.70	370	**0.005**
Cr	10	2.83	10000	**2.83×10^{-4}**
Cs	1	0.2396	97000	**2.47×10^{-6}**
Cd	11	0.09	20	**0.005**
Cu	10	9.77	230	**0.042**
Fe	4	410	No hazard	**No hazard**
Hg	11	0.08	2	**0.036**
In	1	0.05	51600	**9.69×10^{-7}**
Li	1	16.85	22940	**0.001**
Mn	6	156	100000	**0.002**
Mo	5	5.87	21700	**2.70×10^{-4}**
Nb	1	0.25	No hazard	**No hazard**
Ni	12	8.44	220	**0.038**
Pb	12	1.59	100	**0.016**
Rb	1	15.50	NA	**NA**
Sb	5	1.61	2550	**0.001**
Se	6	1.74	1500	**0.001**
Sn	5	1.33	NA	**NA**
Sr	3	226	NA	**NA**
Te	2	4.39	3200	**0.001**
Ti	4	8.37	60000	**1.39×10^{-4}**
Tl	3	0.031	NA	**NA**
U	3	0.49	NA	**NA**
V	6	2.62	450	**0.006**
W	1	0.104	79000	**1.32×10^{-6}**
Zn	11	70.75	100	**0.708**



RCRs for the STP compartment



RCRs for the freshwater compartment after STP discharge



RCRs for the freshwater sediment compartment after STP discharge

Conclusion

- **The assessment of the sewage treatment plant (STP) compartment reveals low risk levels for STP microbial activity**, with consistent risk characterization ratios (RCRs) for metals remaining far below 1, indicating minimal potential risk.
- Considering the **discharge of STP effluent into the environment, a screening of its impact on water and sediment compartments was conducted.**
- Notably, **STPs do not discharge into pristine environments**; thus, the presence of inorganic substances from upstream activities and natural sources **necessitated the addition of regional background concentrations to the local assessments**.
- Preliminary regional background concentrations, obtained from the **MEED regional exposure assessment project** for most substances, were incorporated into the analysis.
- **The approach** taken **is conservative** and does not explore alternative methodologies like the "added" risk approach.
- **In the freshwater environment, RCRs usually stay below 1** for most substances **except Mn**. **This is** predominantly **attributed to the high assessment factor (AF) applied to derive the PNEC,** rather than an excessive presence of manganese in the environment.
- Similarly, **in the sediment compartment, RCRs are below 1** for all substances with available regional concentrations **except Zn**.
- **The RCR for Zn -** a metal released from sources like tire wearing, cosmetics, natural sources, etc. - **in sediment is influenced by both local and regional background concentrations, indicating the necessity to refine this screening assessment using for example added risk, bioavailability concepts, refined regional concentrations or allocation of contributing sources.**

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