

National-scale spatially-explicit health risks associated with persistent mobile and toxic (PMT) chemical exposure via drinking water



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INTRODUCTION

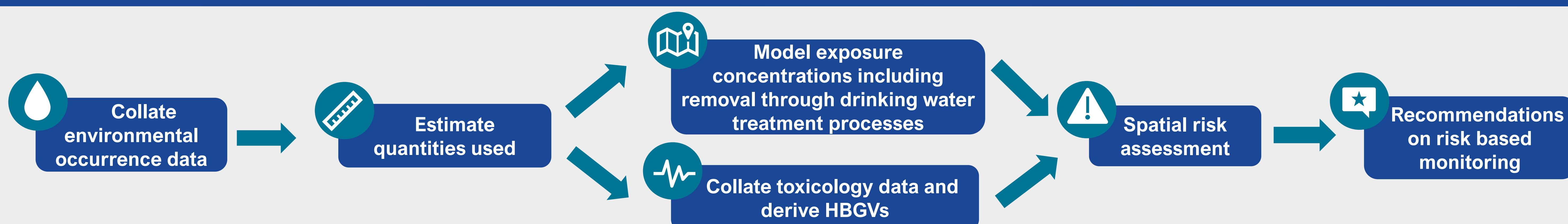
- **Persistent** and environmentally **mobile** substances are more likely to reach groundwater and may not be removed during standard drinking water treatment due to their physico-chemical properties.
- They may pose a risk to human health and the environment by contaminating drinking water sources, especially if they are toxic.
- The Classification, Labelling and Packaging (CLP) regulation (EC) No 1272/2008 has recently introduced criteria to define a new hazard class for persistent, mobile, and toxic substances (PMT), and very persistent and very mobile (vPvM) substances, with the aim of protecting natural resources that could supply drinking water.

AIM:



To conduct a national-scale, spatially-explicit risk assessment of drinking water sources in England and Wales for 22 substances that meet proposed criteria for the hazard class PMT/vPvM.

MATERIALS & METHODS



- A tiered risk assessment was performed for 22 PMT/vPvM substances, increasing in realism of emission estimates.
- Each tier contained different drinking water treatment scenarios: no treatment, conventional treatment, and advanced treatment.
- **Tiered risk assessment methodology:**



RISK ASSESSMENT RESULTS

- Risk characterisation ratios (RCRs) were calculated assuming exposure via drinking water represents 20% of total exposure.

RCRs always <1, even with no treatment
• 2,4,7,9-tetramethyldec-5-yne-4,7-diol
• Trichloroethylene
• Dinoseb
• Amantadine
• Hexamethyldisiloxane
• Tricarbonyl(methylcyclopentadienyl) manganese
• Cyanuric acid
• 2-phosphonobutane-1,2,4-tricarboxylic acid
• 4-hydroxy-2,2,6,6-tetramethylpiperidinoxyl
• 4-aminophenol
• 2-morpholinoethanol
• 2,2'-azobis[2-methylbutyronitrile]
• 1,3-dichlorobenzene
• N-butylbenzenesulphonamide
• 1,2-benzisothiazol-3(2H)-one 1,1-dioxide (saccharin)
• Triclosan

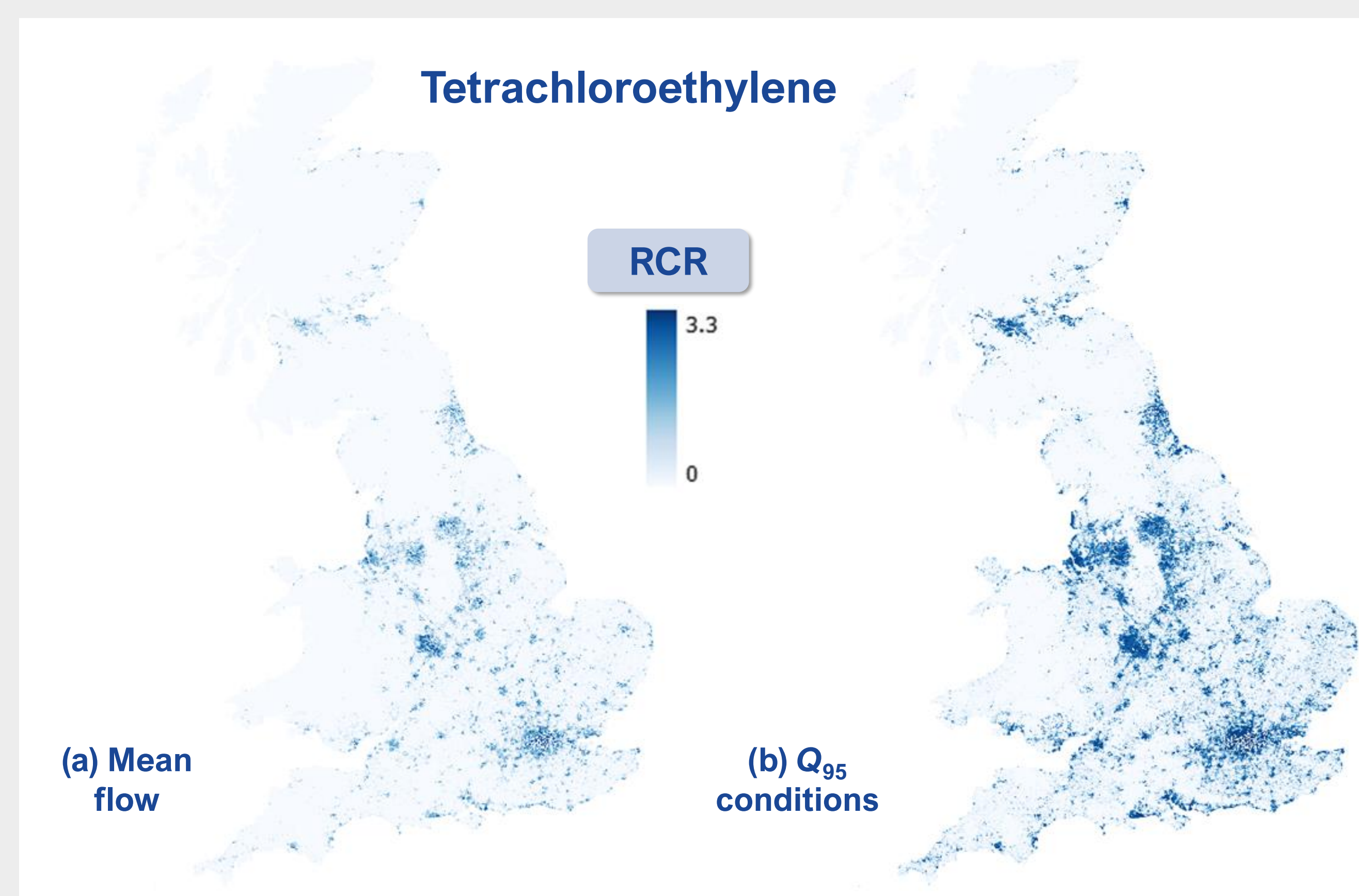
RCRs >1 without treatment
• 1,4-dioxane
• Tetrachloroethylene
• Melamine
• Dapsone
• 1,4,5,6,7,7-hexachloro-8,9,10-trinorborn-5-ene-2,3-dicarboxylic anhydride
• 2,2'-dimethyl-2,2'-azodipropionitrile (APN)

RCRs >1 with conventional treatment
• 1,4-dioxane
• Tetrachloroethylene
• 1,4,5,6,7,7-hexachloro-8,9,10-trinorborn-5-ene-2,3-dicarboxylic anhydride

All RCRs were <1 with advanced treatment.

Tier 4 spatial assessment results:

- For the 3 substances where risk was indicated, a spatially-based risk assessment was performed using modelled surface water concentrations for England and Wales.
- A potential risk at some surface water abstraction sites with conventional treatment was identified for all 3 substances.
- An example output with tetrachloroethylene is illustrated below:



CONCLUSIONS

- 22 PMT/vPvM substances have been investigated for their potential risk to drinking water.
- When advanced drinking water treatment processes are considered, risk to human health is low.
- Not all PMT substances were studied; the list should be regularly reviewed and updated.
- Quantitative monitoring data for these substances at drinking water abstraction points in England and Wales would be a useful additional line of evidence.

Download the poster:

