

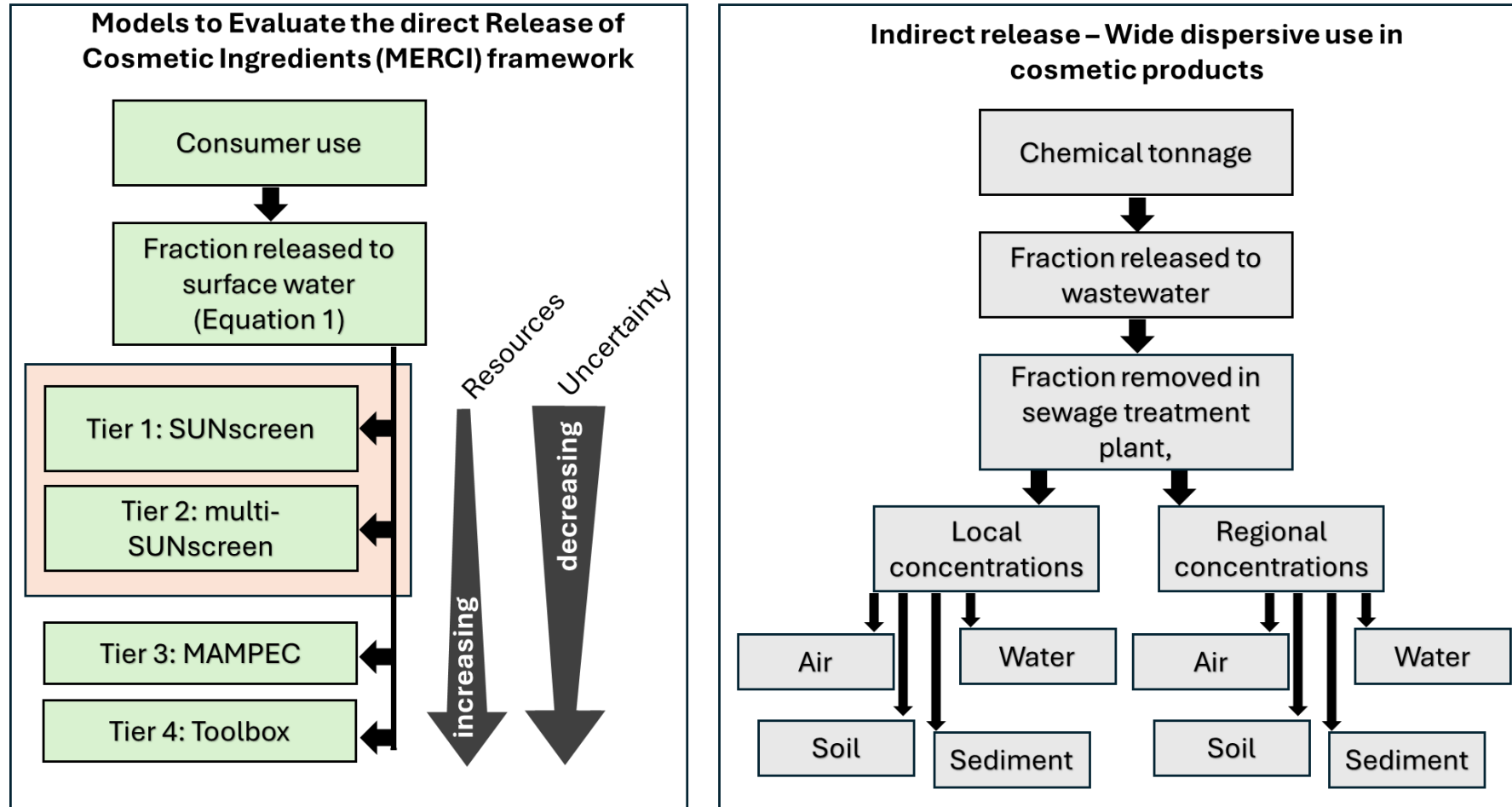
Screening-level exposure Models to Evaluate the direct Release of Cosmetic Ingredients (MERCi): Development and application to UV filters used in suncare products

**Todd Gouin, Maura Roberts, Marty
Williams, Eva Klingelmann, Sascha
Pawlowski, Arnaud Boivin, Ahmed Tlili,
Ryan Heisler, Amelie Ott**



Tiered exposure assessment

- UV filters used in suncare products can result in both direct and indirect releases to the environment.
- The MERCI framework is designed to integrate into existing regulatory risk assessment processes, offering a tiered approach that balances scientific rigor with practical applicability for regulators and industry

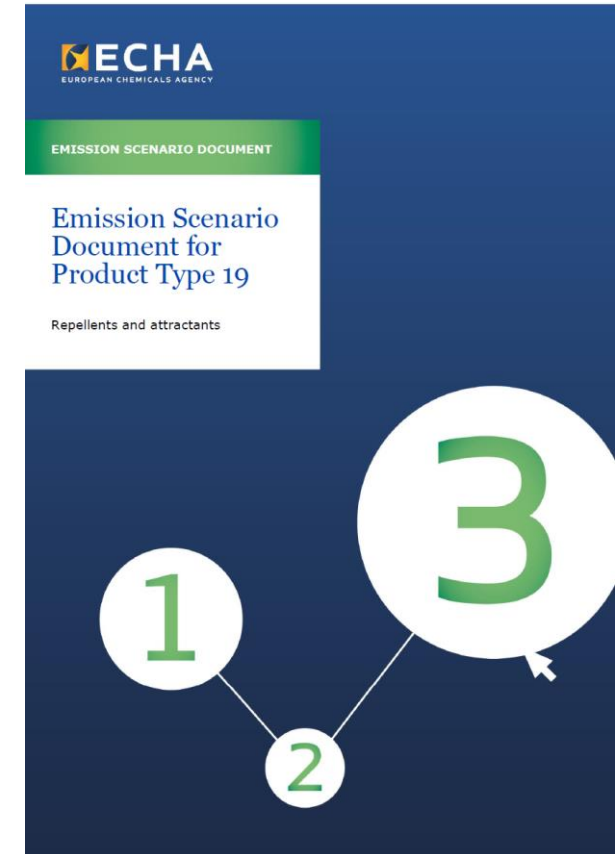
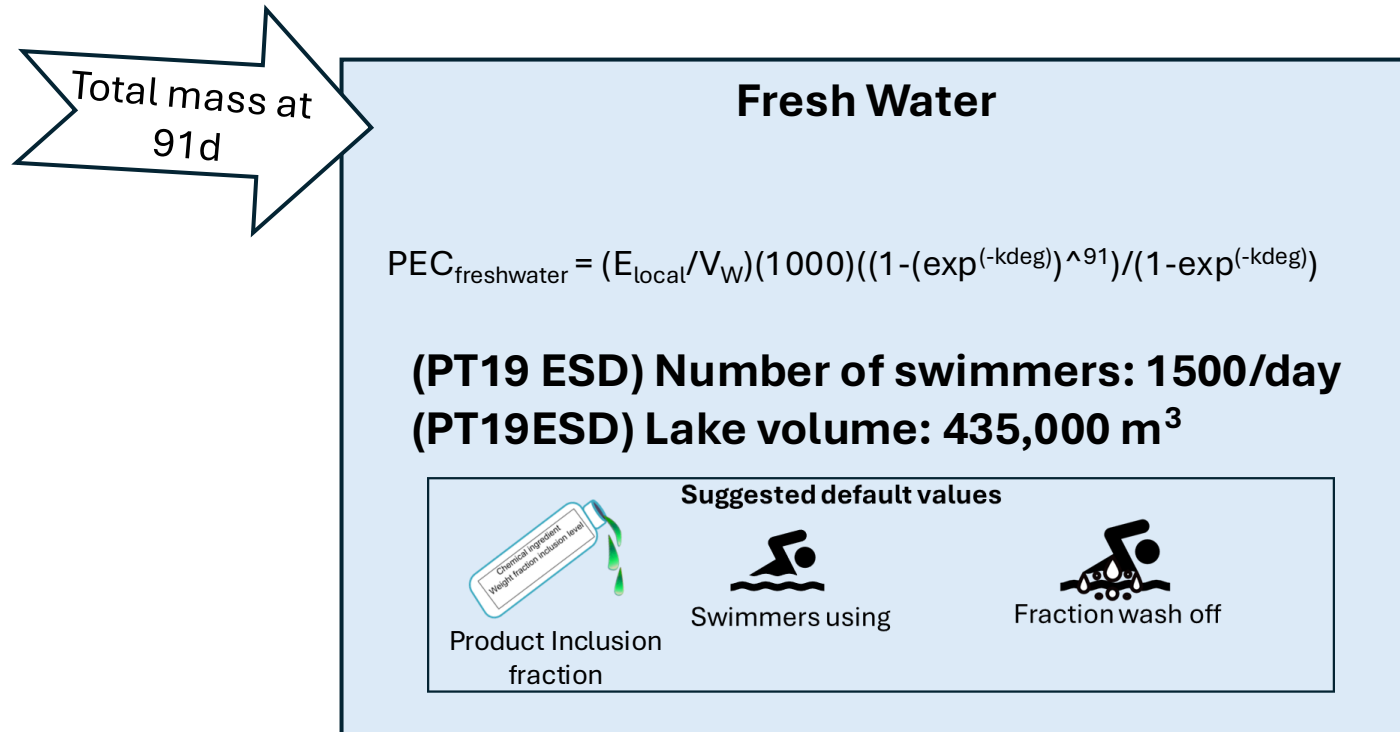


Estimating emissions

- The challenge
 - How to estimate the release of UV filters from suncare products owing to their recreational use?
- Key data needed to estimate environmental emissions include:
 - Amount of sunscreen applied
 - Skin area covered by application
 - Mass fraction amount of ingredient in product
 - The fraction of ingredient 'washed-off'
 - Market share of product used

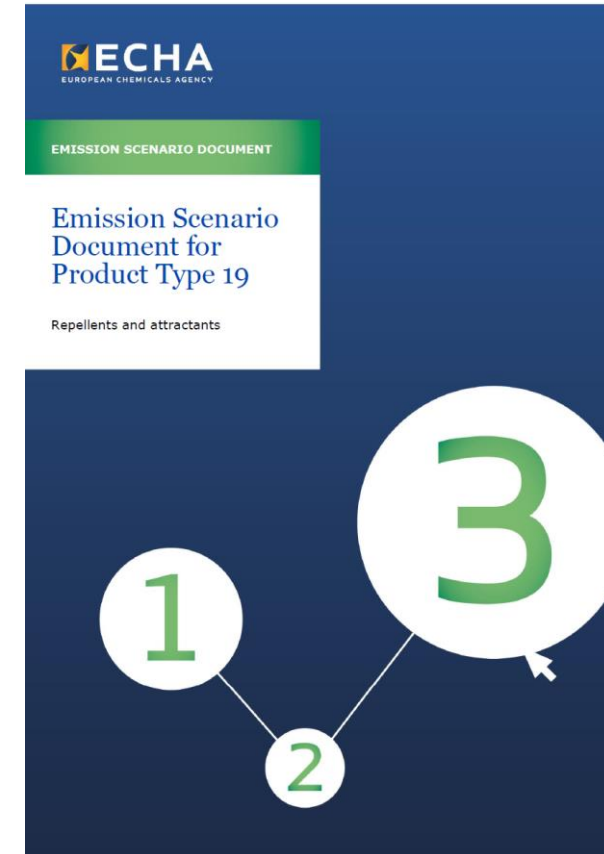
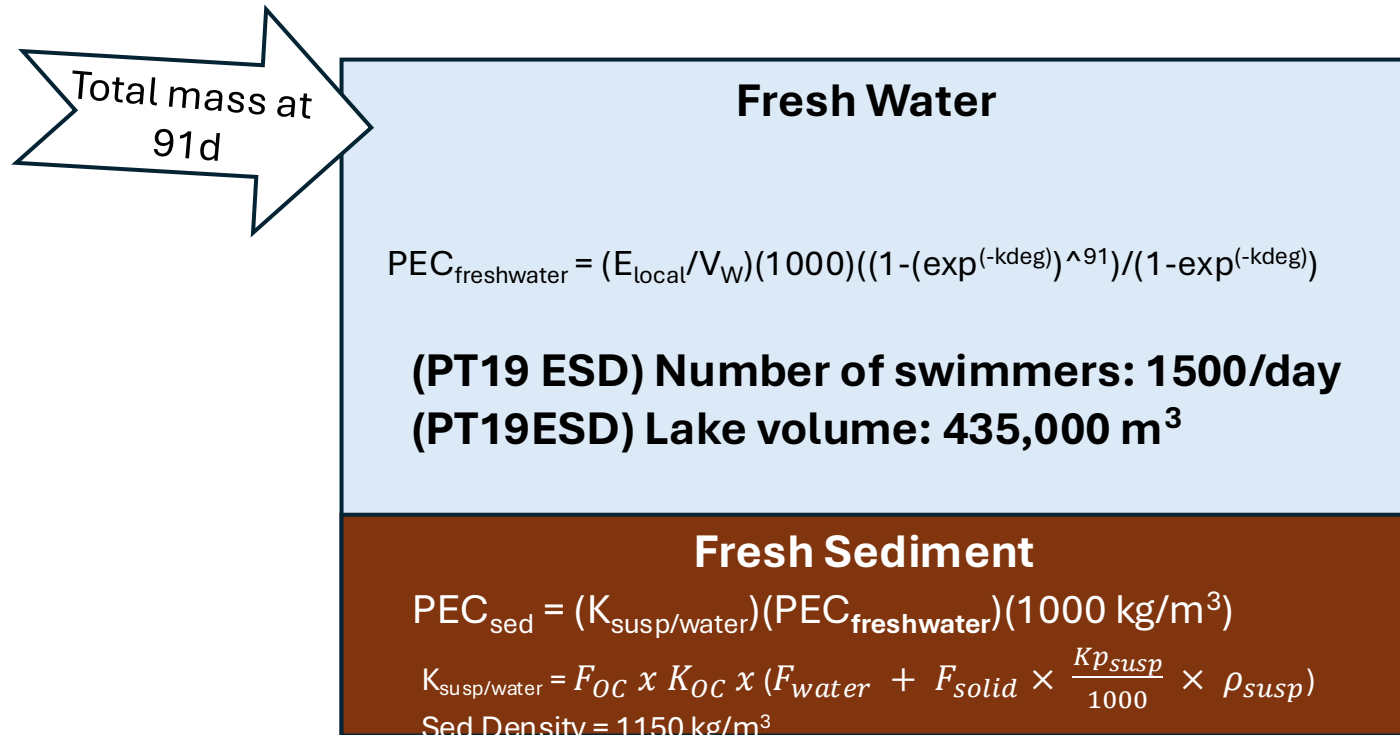
Emission Scenario Document for Product Type 19

- Provides guidance for risk assessors to estimate emissions of active substances to surface water bodies through swimming
 - Limited to a lake or reservoir
 - Due to dilution effects, coastal areas and rivers are not considered

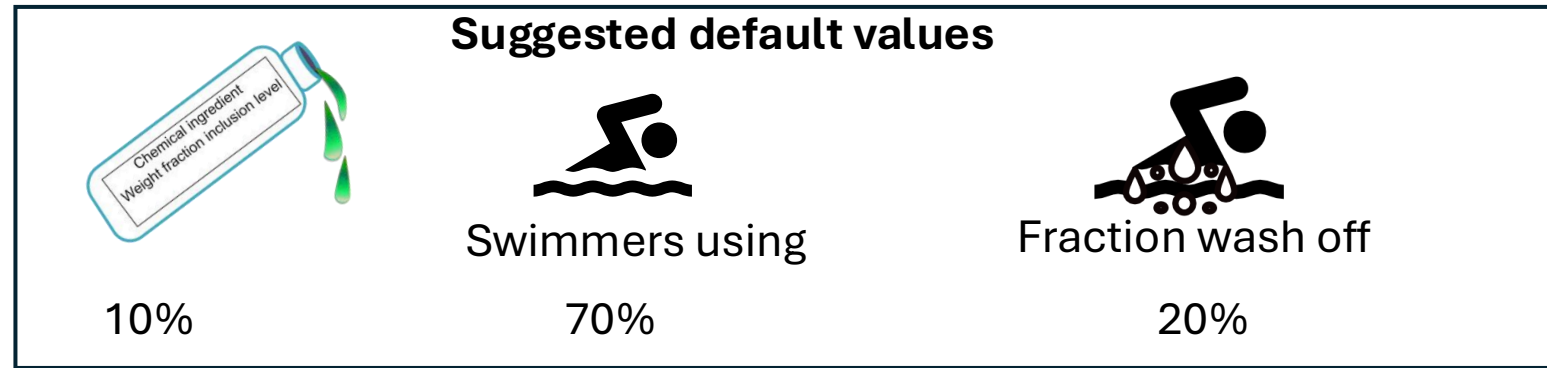


Emission Scenario Document for Product Type 19

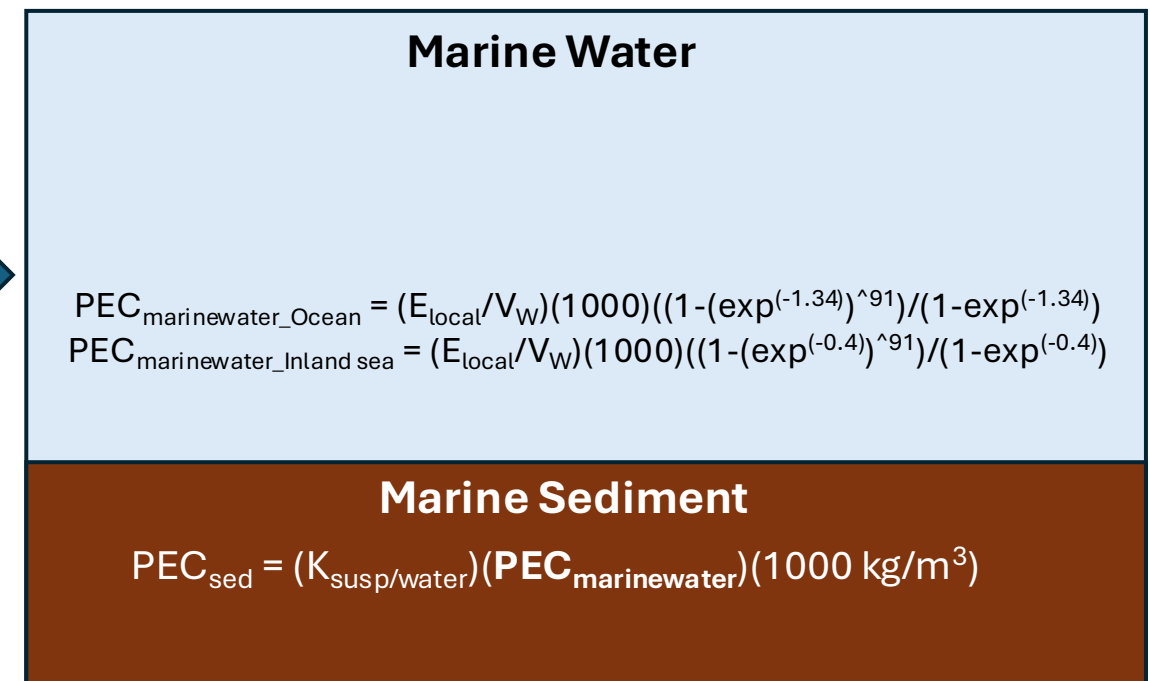
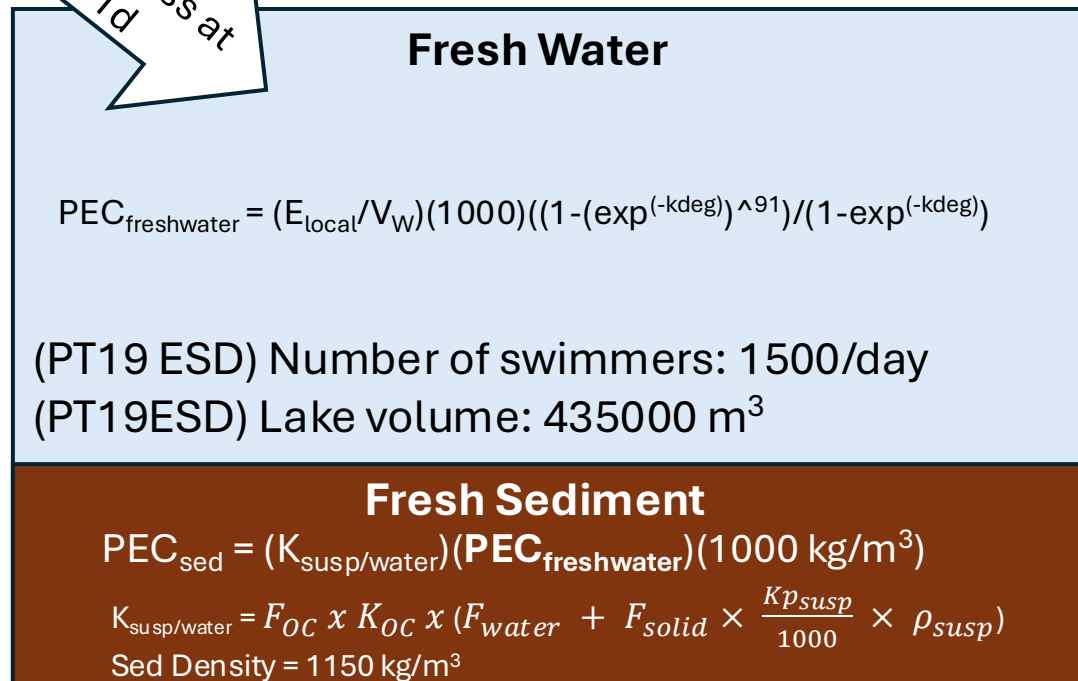
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Tier 1: SUNscreen



Total mass at
91d

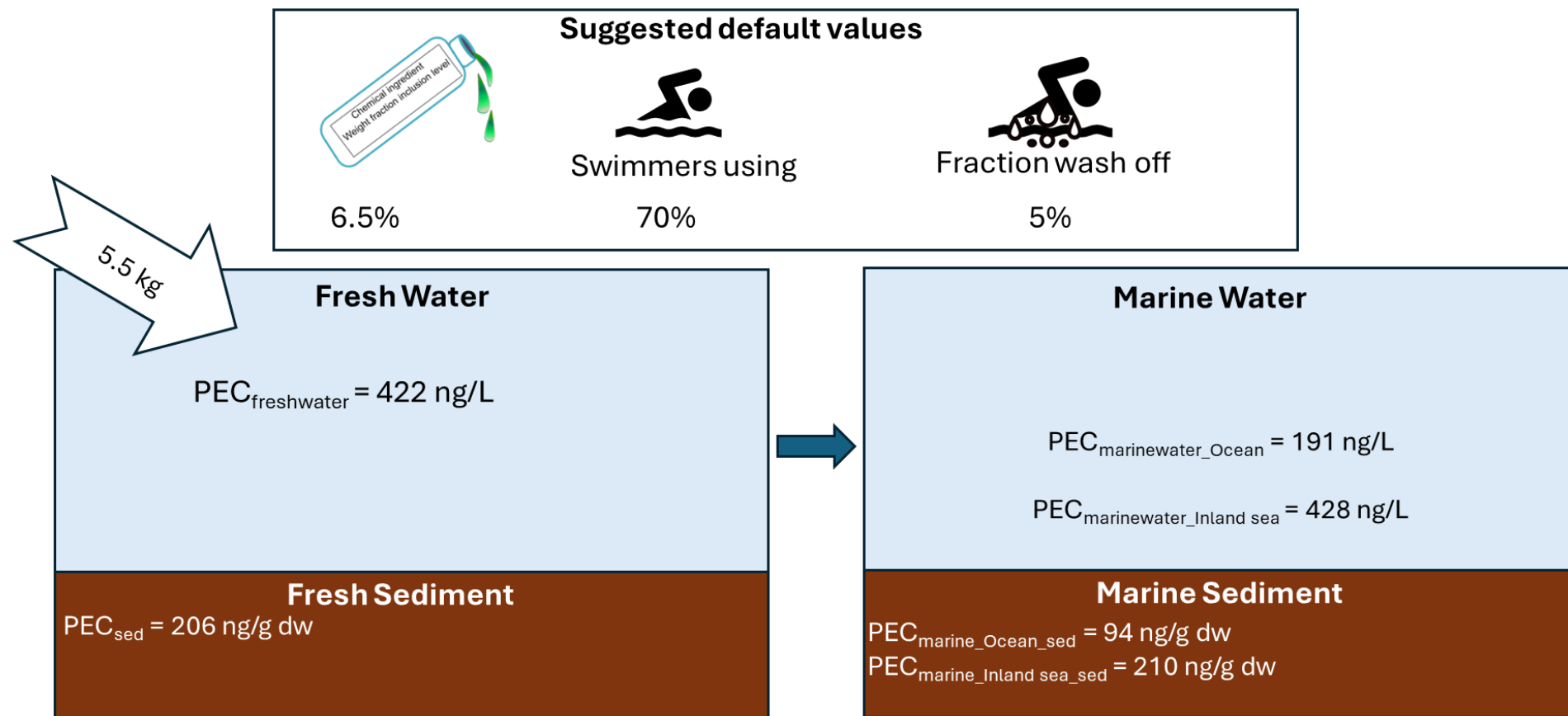


- Low tier (highly conservative)
- A strength of the approach is that it provides a relatively simplistic and transparent approach to emissions estimates related to recreational swimming activities

Application to Octocrylene

Property	Value
Molecular mass (g/mol)	361.48
Solubility (mg/L)	0.04
Henry's Law Constant (pa.m ³ /mol)	0.00842
Log K _{ow}	6.1
K _{oc}	48898
Water half-life (h)	40.8 (fw); 98.4 (marine)
Sediment half-life (h)	1157 (fw); 1644 (marine)

Sunscreen – Octocrylene



- PECs are observed to be overestimates as compared to the central tendency of the monitoring data
- Gouin (2025)
 - PEC_{fw} = Geometric mean concentrations of 30 ng/L; $PEC_{\text{fw_sed}}$ (recreational site) = 4.3 ng/g dw
 - PEC_{marine} = Geometric mean concentrations of 37ng/L; $PEC_{\text{marine_sed}}$ (estuarine) = 6.9 ng/g dw

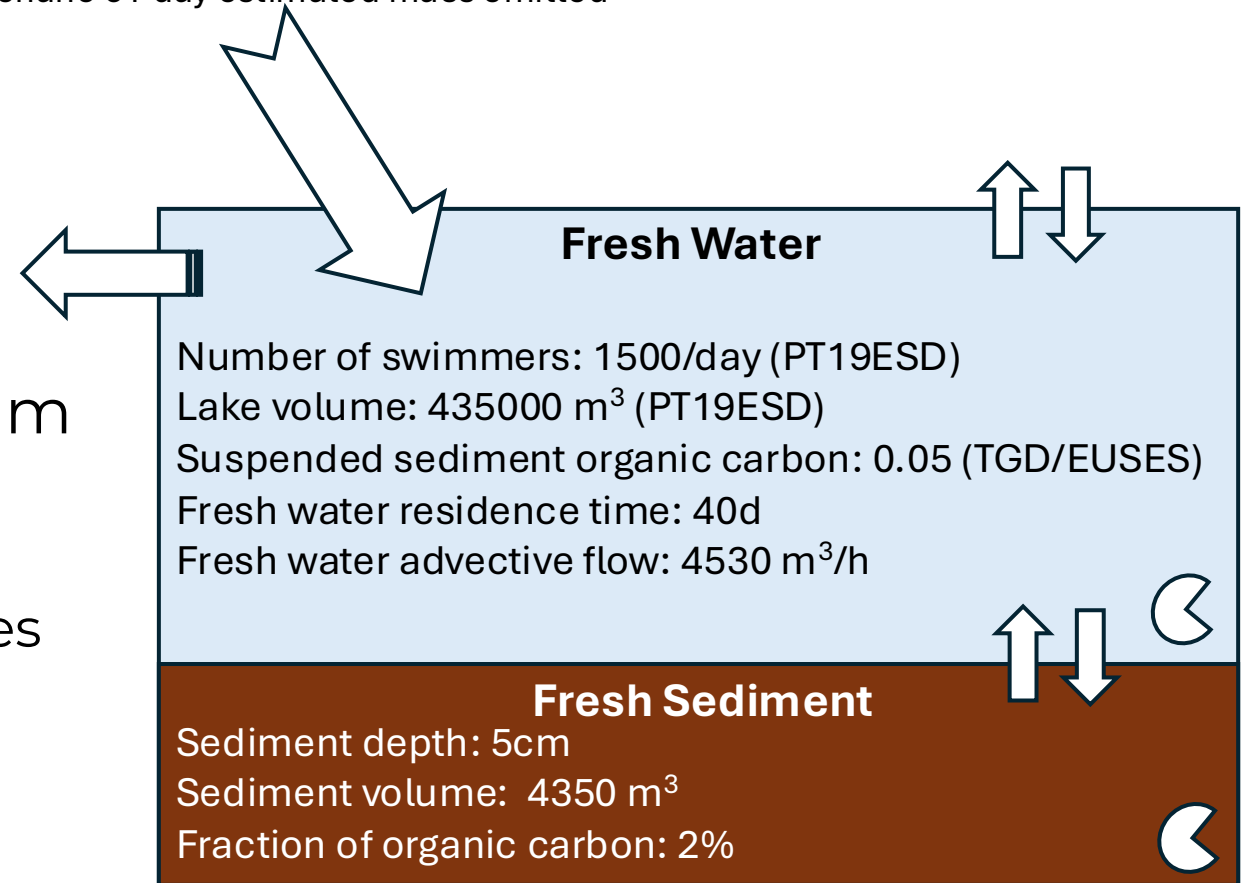
Multimedia fate model: multi-SUNscreen

Tier 2 model

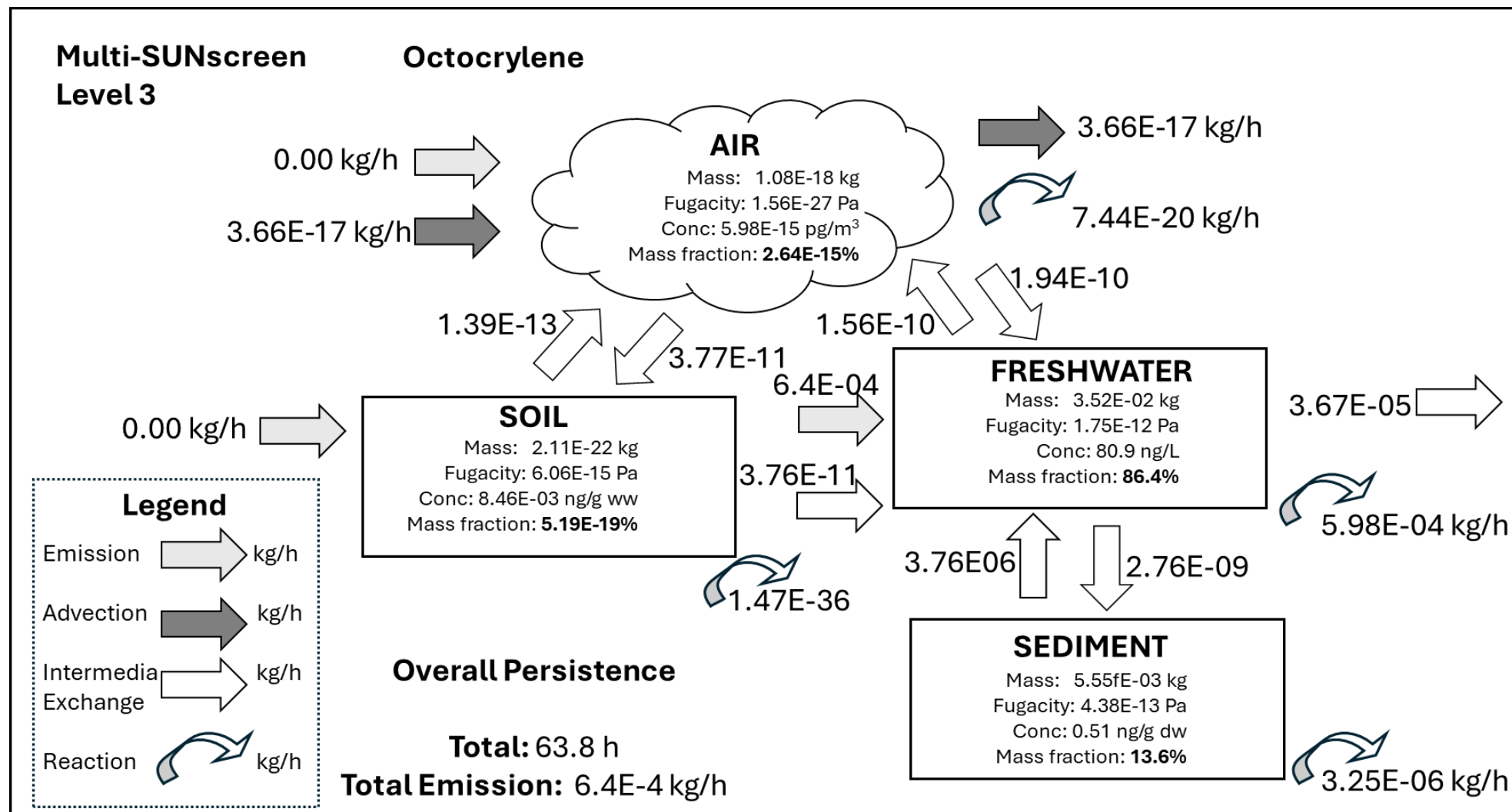
multi-SUNscreen

- Fugacity-based multimedia environmental fate model
- Steady-state and non-equilibrium assumptions
 - Steady-state emission
 - Multimedia mass transfer processes included
 - Water/sediment
 - Water/air
 - Air/soil

Steady-state emission is the PT19 emission scenario 91 day estimated mass emitted



Multimedia fate model: multi-SUNscreen



Conclusions

- Building on the adoption of the PT19 ESD a reasonable estimate of emissions/release of UV filters used in suncare products can be obtained
- The screening level exposure assessment models are shown to provide realistic worst-case estimates of exposure of Octocrylene in aquatic systems with a direct release scenario
- The freely available MERCI screening level models fill a recognized gap in the regulatory toolbox for cosmetic ingredients with direct release scenarios
- Provides a science-based refinement to existing emission scenarios (e.g. PT19 ESD)
- Intended to be useful and accessible to Member States, EU and US regulatory bodies, as well as industry risk assessors

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Screening-level exposure models to evaluate the direct release of cosmetic ingredients: development and application to ultraviolet-light filters used in suncare products

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