

Relevance of PEC and PNEC from EFSA Conclusions

As compared to Measured Environmental Concentrations and Water Quality Objectives in Sweden

Abstract

- Predicted Environmental Concentrations (PEC) and Predicted No Effect Concentrations (PNEC) reported in EFSA conclusions were compiled for 184 pesticide substances
- Their relevance was assessed by comparing them to Measured Environmental Concentrations (MEC) as well as Water Quality Objectives (WQO) used in Sweden

Methods

- The PEC and PNEC values have been compiled in a database comprising 184 substances
- PEC values chosen for the comparison are PEC_{sw} FOCUS Step 3 for the scenarios D1 and D4 as they are most relevant for Swedish conditions
- PNEC values were calculated from the lowest toxicity endpoint, divided by the assessment factor
- The values were compared to Swedish Water Quality Objectives and Measured Environmental Concentrations from the Swedish national monitoring program for pesticides for the years 2009-2017
- 116 substances have both a PNEC and a WQO, allowing a comparison

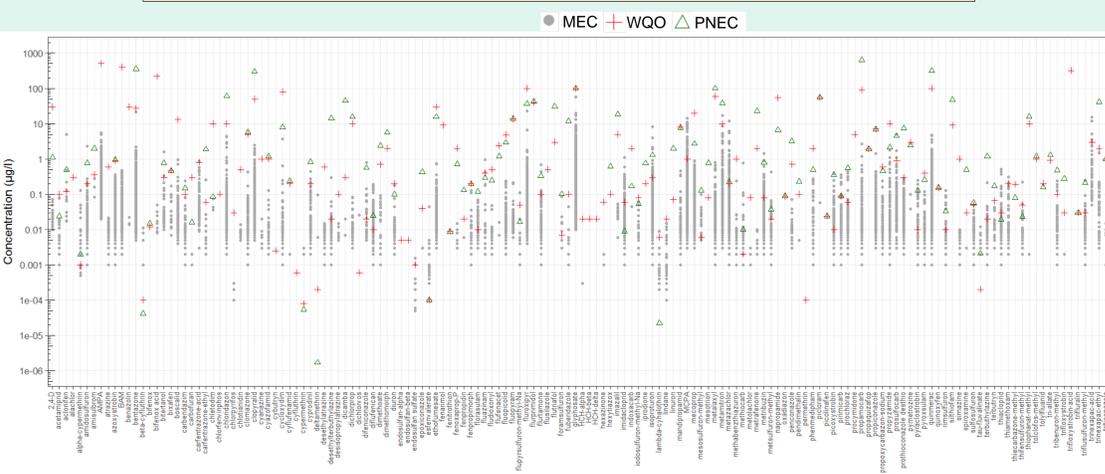
Water Quality Objectives (WQO) used:

- EQS for EU priority substances - Water Framework Directive
- River basin specific pollutants - Swedish Agency for Marine and Water Management
- National guideline values - Swedish Chemicals Agency
- Preliminary guideline values - Swedish University of Agricultural Sciences (SLU)

Measured Environmental Concentrations (MEC) used:

- Data from the Swedish national monitoring program 2009-2017
- Four small catchments (8-16 km²) with high agricultural intensity (85-92 % agricultural land)
 - Two larger rivers (102 km² and 488 km², 86 % and 66 % agricultural land respectively)
 - Surface water samples analyzed for ~140 pesticide substances including most of the pesticides used in Sweden today as well as a large number of legacy compounds
- See Boye et al. (2019) for a description of the monitoring program

Ecological risk assessment (PNEC vs WQO)



PNEC and WQO diverge and show different ecological risks

Of a total of 116 substances:
69 st PNEC > WQO
11 st PNEC = WQO
36 st PNEC < WQO

MEC > PNEC:

imidacloprid	(31 %)
esfenvalerate	(5,4 %)
metazachlor	(5,0 %)
diflufenican	(4,7 %)
thiacloprid	(3,3 %)
lambda-cyhalothrin	(2,3 %)
methiocarb	(1,3 %)
alpha-cypermethrin	(1,2 %)

Quotients PNEC/WQO:

Mean:	13,3
Median:	1,5
Max:	700
Min:	0,004

MEC > WQO:

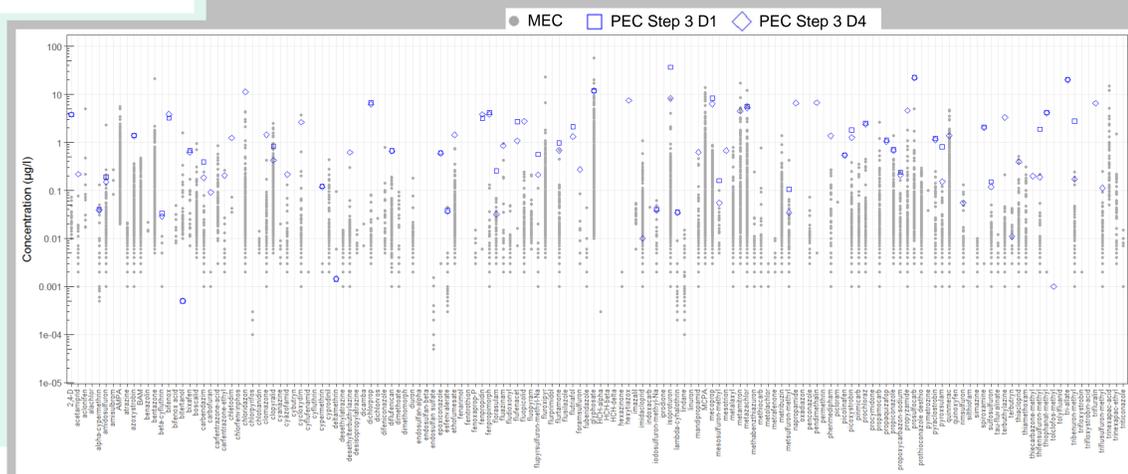
diflufenican	(16 %)
picoxystrobin	(6,3 %)
esfenvalerate	(5,4 %)
metazachlor	(5,0 %)
metribuzin	(4,4 %)
imidacloprid	(4,2 %)
methiocarb	(4,1 %)
pyraclostrobin	(3,4 %)
MCPA	(3,3 %)
thiacloprid	(2,2 %)
isoproturon	(2,2 %)
...	
+ 10 substances > 1 %	

Fate assessment (PEC vs MEC)

5 substances have > 1 % of MEC above any PEC

MEC > PEC:

imidacloprid	(28 %)
bitertanol	(3,6 %)
clopyralid	(2,4 %)
terbutryn	(1,2 %)
quinmerac	(1,1 %)



Conclusions

- PEC are mostly above or at the same level as the highest measured concentrations from the Swedish national monitoring program
- PNEC and WQO diverge, and for a majority of the substances the WQO is lower than the PNEC (69 out of 116)
- Substances are considered problematic when comparing measured concentrations to WQO, but measured concentrations are at the same time acceptable according to the registration process (PNEC) - a pedagogic problem that could potentially undermine the registration process
- Farmers might be pointed out as responsible for WQO exceedances, even when they use pesticides in an approved way



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