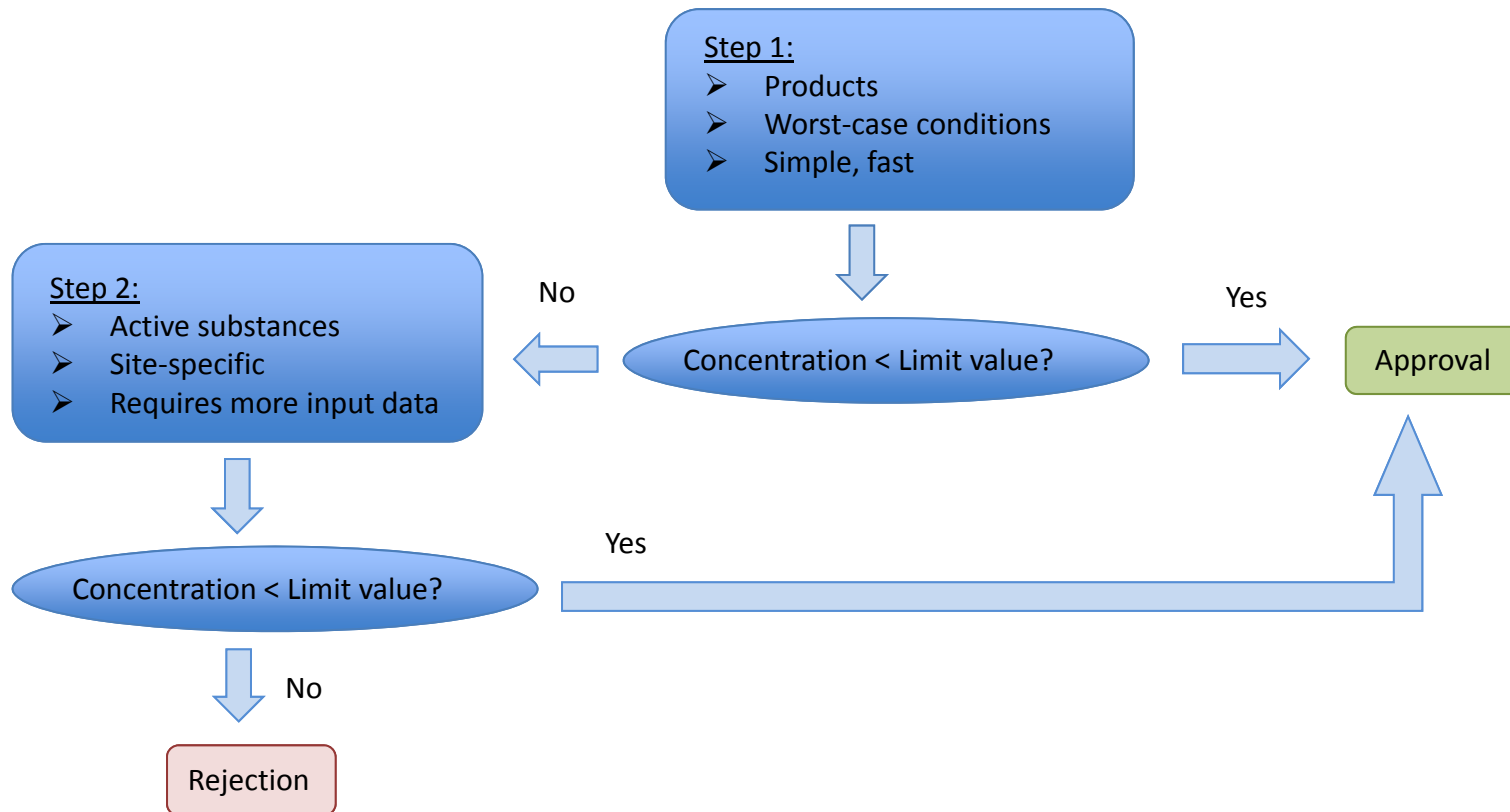


Risk assessment for drinking water protection areas in Sweden

Background

- Farmers must apply to local authorities for permits to use PPP's in drinking water protection areas (WPA)
- Lack of support for local authorities to help them carry out the necessary risk assessment
 - KEMI's "List of mobile substances" (withdrawn 2011)
 - CKB summaries of EU documentation (withdrawn 2013)
- CKB funded work to develop a decision-support tool (MACRO-DB)
 - Introduced in 2014 and now recommended for this purpose by the *Swedish Agency for Marine and Water Management* (HaV), the responsible Swedish authority

MACRO-DB : a two-step process



Climate data
precipitation, temperature, PET



MACRO-DB

Pedotransfer

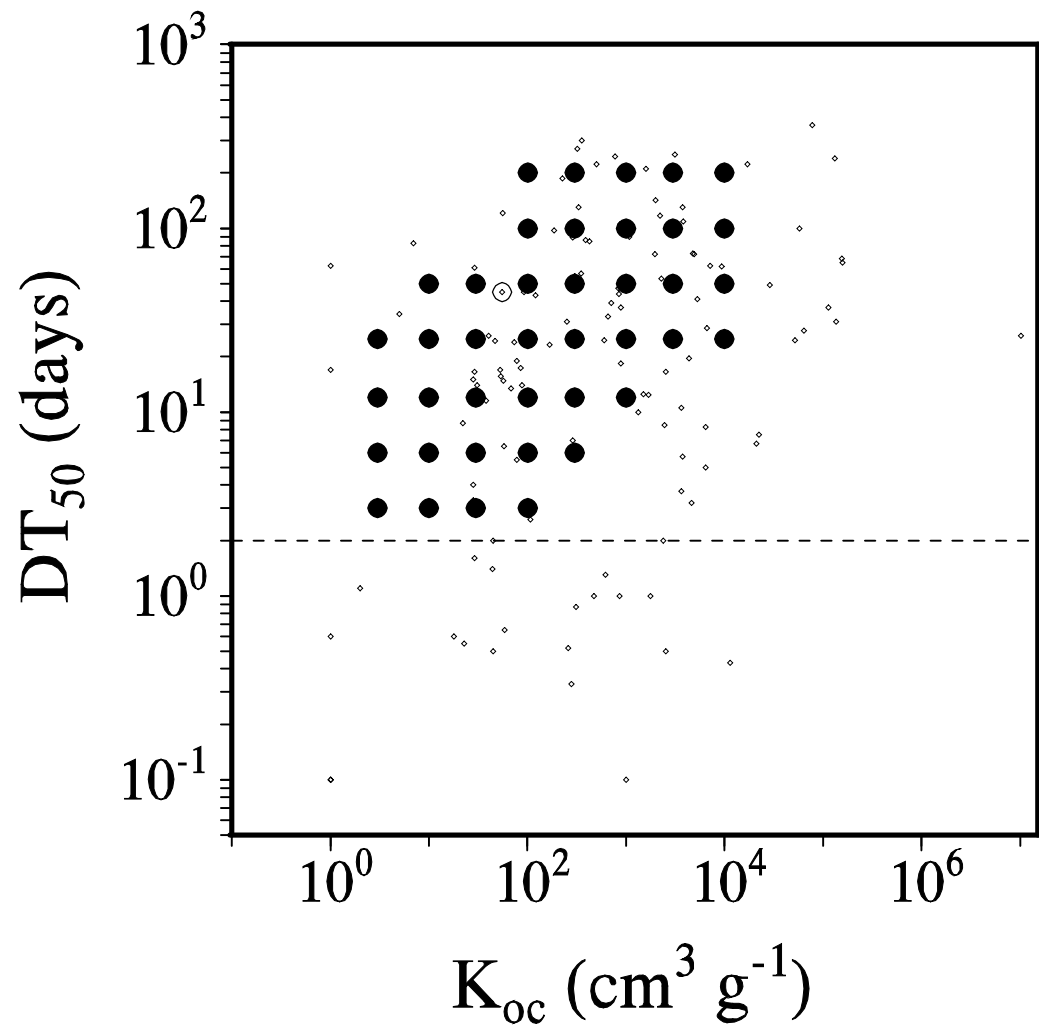
Soil type
Quaternary geology (parent material)

Soil properties
Texture, organic matter

Pesticides and crop
Crop type, properties of PPP,
dose, timing, method

Step 1

- Fast web application (meta-model of MACRO-DB, 'look-up' tables)
 - Pre-run generic 'extreme worst-case' MACRO-DB simulations
 - Climate of south-west Sweden
 - Eleven soil types (hydrology/texture):
 - 5th-percentile organic carbon content in topsoil
 - >95th-percentile for texture ("clayey" clays and "sandy" sands)
 - Model (linear adsorption)
- Only simple input data required
 - Product, dose and timing
 - Proportion of arable land
 - Protection goal (groundwater, surface water or both)
- 40 hypothetical pesticides



Approval:

Leachate concentrations
<0.1 µg/L for **all active**
substances on all soils

Input data to MACRO-DB

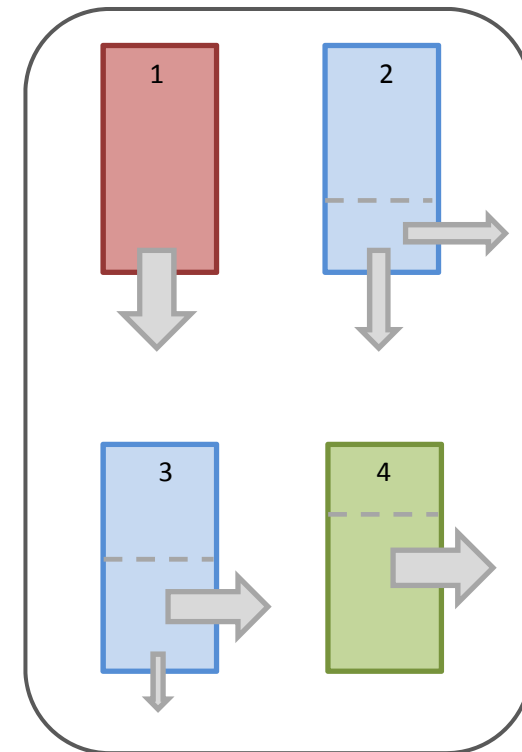
- Soil type (texture, organic matter)
 - Local data or national maps
- Climate (zone)
 - 26 years of weather data
 - Precipitation, temperature, potential ET
- Crop type and proportion of arable land in WPA
- Substance properties (PPDB database)
 - <http://sitem.herts.ac.uk/aeru/ppdb/en/index.htm>
- Applications (method, timing, dose)
- Parent material (Geological survey maps)
 - Determines the partitioning between groundwater recharge and discharge to surface water



Parent material and hydrological classes

Quaternary geology (SGU)	Subsoil texture	Hydrological class	
		Drained	Undrained
Eskers (mainly sand/gravel)		-	1
Sedimentary rock		-	1
Moraines	Coarse	-	2
	medium, medium-fine	3	2
	Fine	3	-
Crystalline rock		-	3
Coarse silt/fine sand, sand or gravel		4	2
Clay/silt sediments		4	2
Organic soils		4	-
Alluvial sediments		4	-

Red = recharge area
 Blue = both recharge and discharge area
 Green = discharge area



Outputs

- Average concentration for 20-year period
 - Excludes 6-year warm-up period
 - $< 0.1 \mu\text{g/L}$ acceptable
- Results have been benchmarked for test simulations for two of the three national groundwater scenarios used for product registration in Sweden

Future prospects (1)

- Only ca. 30-40% of product uses pass Step 1
- MACRO-DB Step 2 is very time-consuming and costly for both farmers and the local authorities
 - Especially for large water protection areas (usually for surface water abstraction) with many farmers.
- It is important to focus effort where it is likely to be of value
 - Dilution is not considered in registration procedures
 - Can we identify WPA's where dilution would be sufficient to ensure negligible risk, without requiring any additional risk assessment?

Future prospects (2)

- An analysis of monitoring data in Sweden suggested that the contamination risk from pesticides approved for use in agriculture is negligible in catchments where the proportion of arable land is less than 15%
- Proposal from the *Swedish Agency for Marine and Water Management* (HaV) to eliminate the need for application permits in water protection areas that fulfill this criterion (Step '0')

”Dilution is the solution to pollution”