

# EVALUATION OF ACTIVE SUBSTANCES IN PLANT PROTECTION PRODUCTS AND THEIR FATE AND BEHAVIOR IN THE ENVIRONMENT (in soil and groundwater)

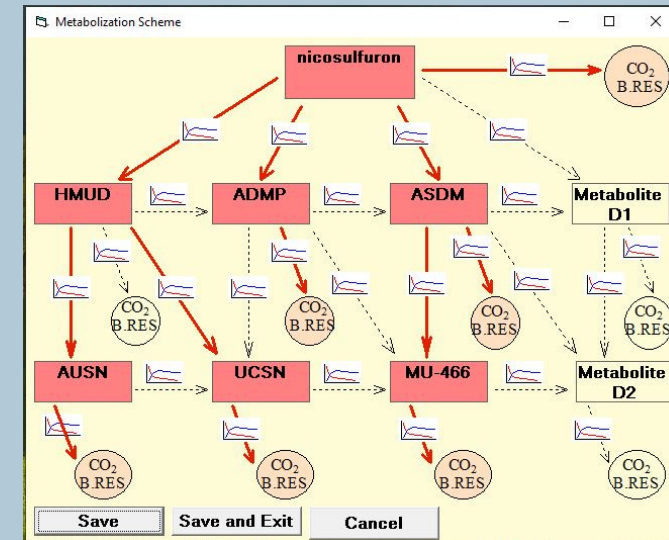
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The Water Research Institute focuses on assessing the impact of pesticides on groundwater and soil to enable or disable the authorization of plant protection products for the market. In our work, we employ the evaluation of predicted environmental concentrations in groundwater and soil to ensure the safety of these products\*.

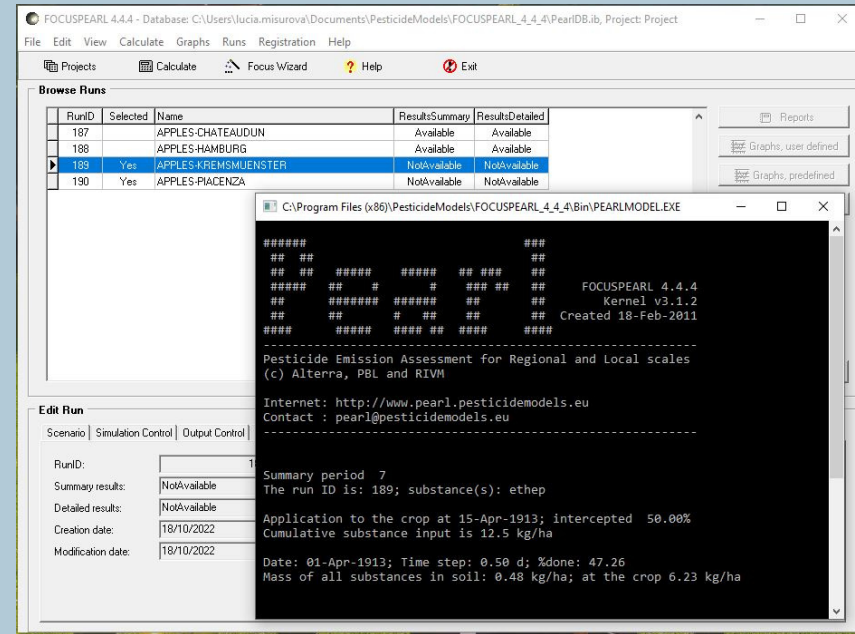
- On the basis of the Regulation (EC) No 1107/2009 of the European Parliament and the Council, dated 21 October 2009, which establishes the foundational framework within the EU governing the marketing, evaluation, and control of plant protection products. This regulation serves as the legal underpinning for the assessment of plant protection products, including their active ingredients, safeners, synergists, and co-formulants.

The FOCUS groundwater team established nine "realistic worst-case" leaching scenarios for the EU. Each scenario identifies the 80th percentile annual average leaching concentration at 1 m soil depth over 20 years as the key indicator (PEC<sub>gw</sub>). These scenarios reflect soil and climatic conditions.

Program PELMO (Pesticide Leaching Model)

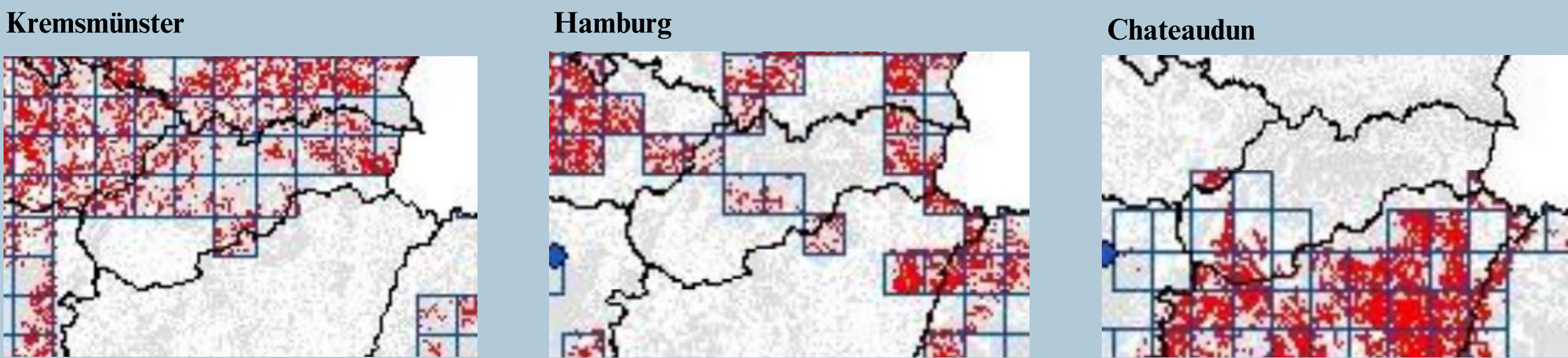


Program PEARL (Pesticide Emission Assessment at Regional and Local scales)



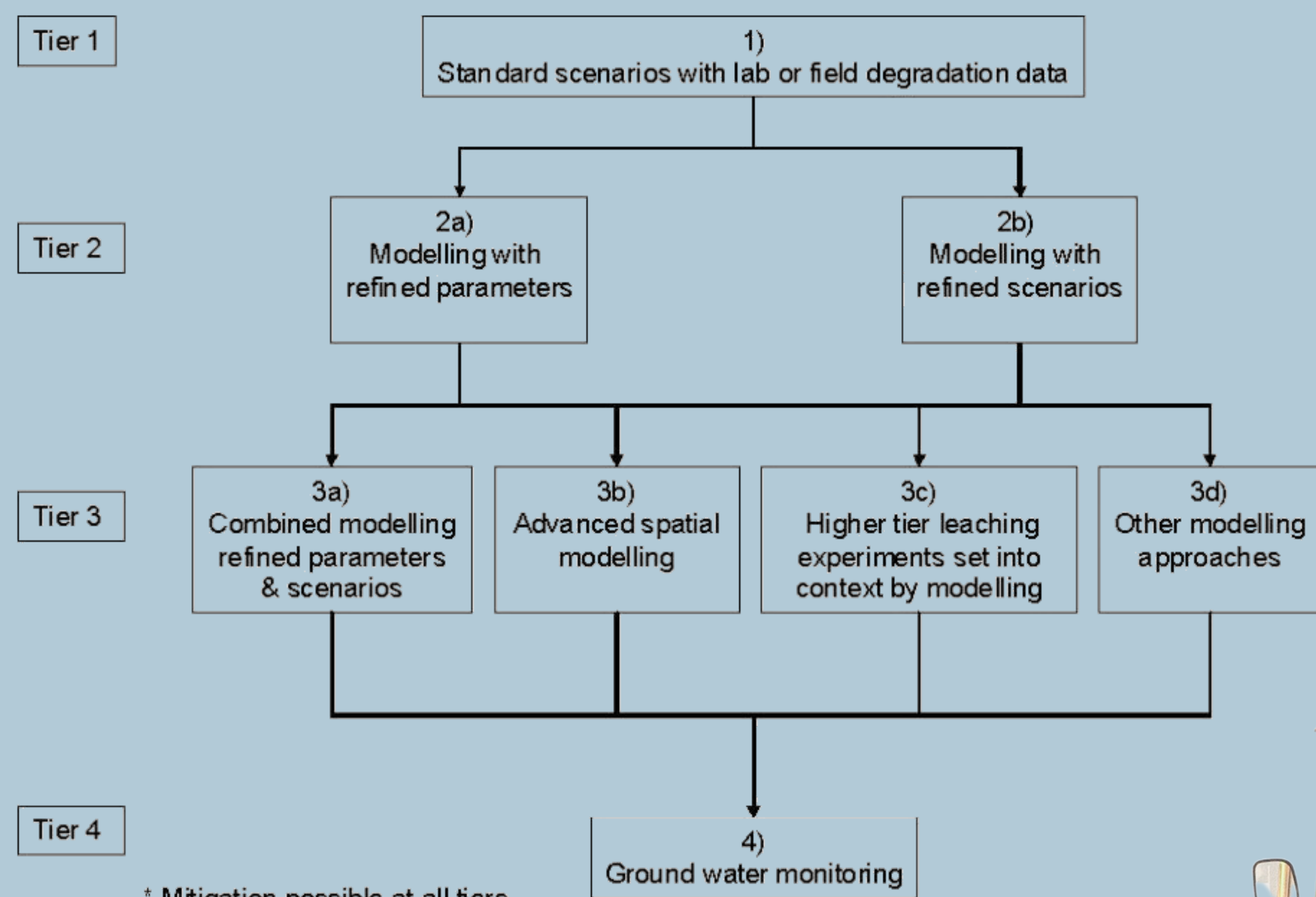
Slovakia's landscape is mainly aligned with the Kremšmünster climate, while Hamburg's relevance is more localized. In the southern region near Bratislava and along the Danube, the Châteaudun climate zone applies. The supporting scenario utilized is Piacenza. The FOCUS groundwater team unified leaching models (PEARL, PELMO, PRZM, and MACRO) which are used to calculate predicted environmental concentration in groundwater (PEC<sub>gw</sub>).

Major soil and climatic properties of the four FOCUS groundwater scenarios considered representative for Slovak agricultural areas (based on FOCUS, 2009).



The FOCUS groundwater report (EC, 2014) introduced guidance for advanced exposure assessments, including refined substance parameters (Tier 2a), refined scenarios (Tier 2b), combined approaches (Tier 3a), spatial modeling (Tier 3b), leaching experiments contextualized by modeling (Tier 3c), and alternative methods (Tier 3d), available at EU and national levels. The highest level, Tier 4, is represented by groundwater monitoring.

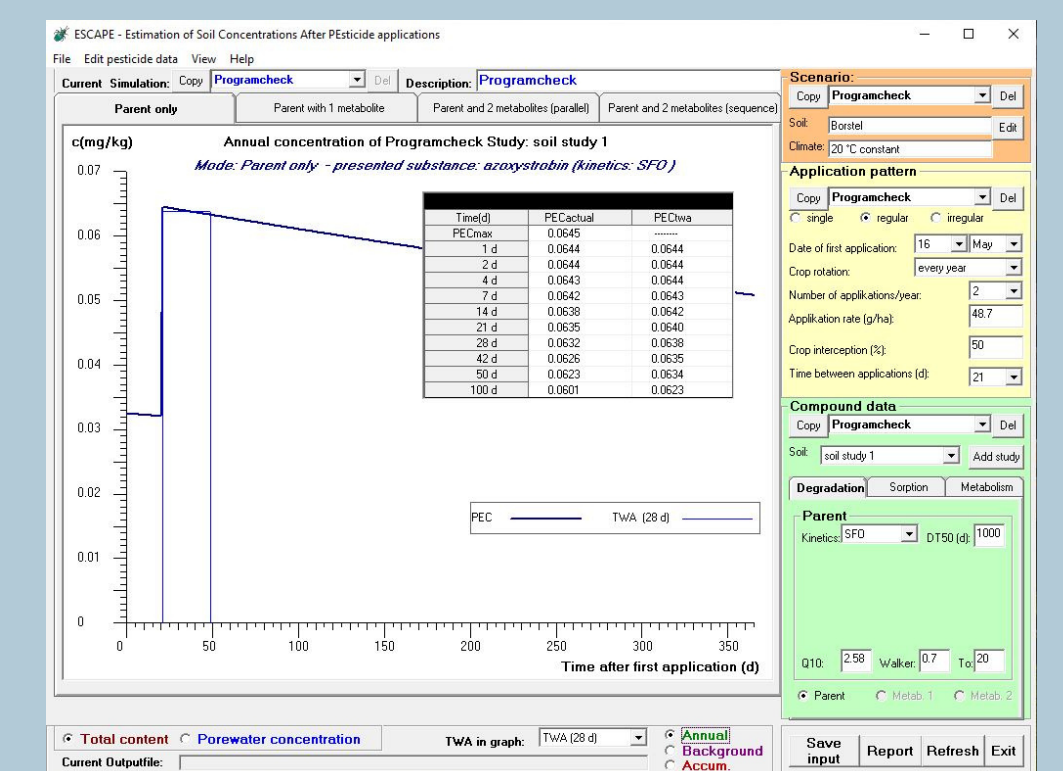
Proposed Generic Tiered Assessment Scheme for Ground Water (Sanco/13144/2010, version 3, 10 October 2014)



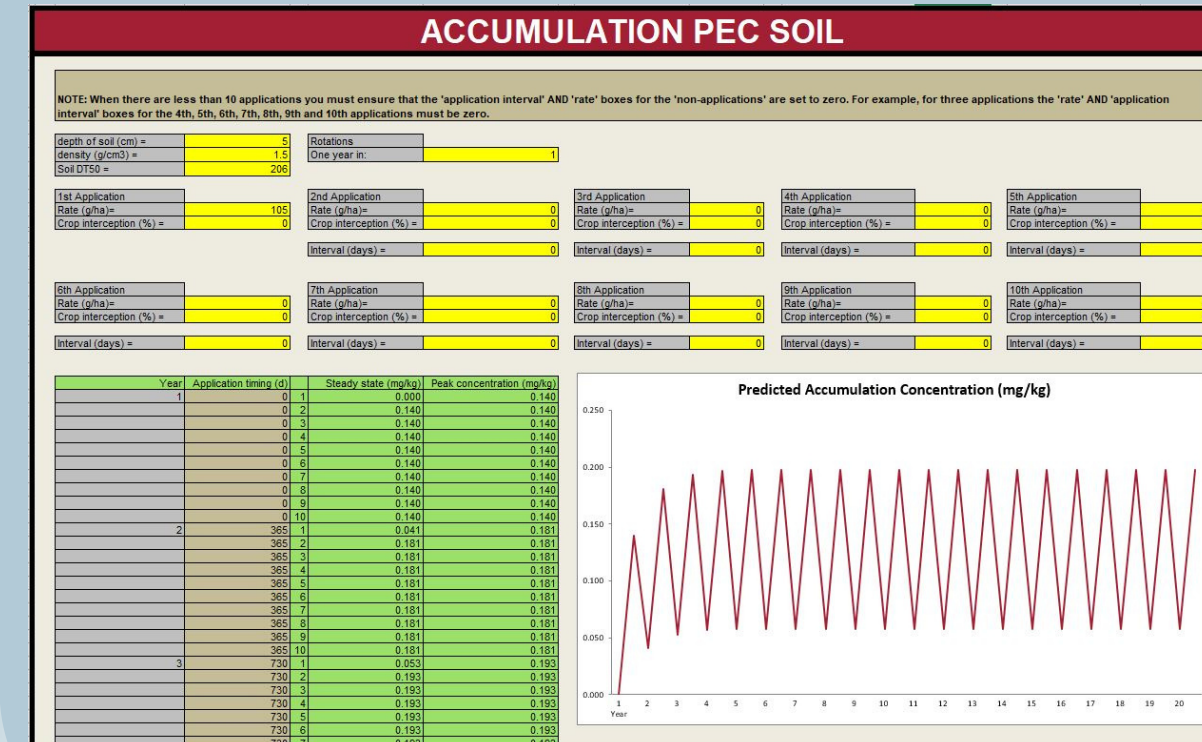
\* Mitigation possible at all tiers

Soil exposure assessment currently relies on soil modeling, focusing on degradation/dissipation processes (DT50). Metabolites' application rates are adjusted using the most frequent soil occurrence and molar masses.

Program ESCAPE (Estimation of Soil Concentration After Pesticide applications)

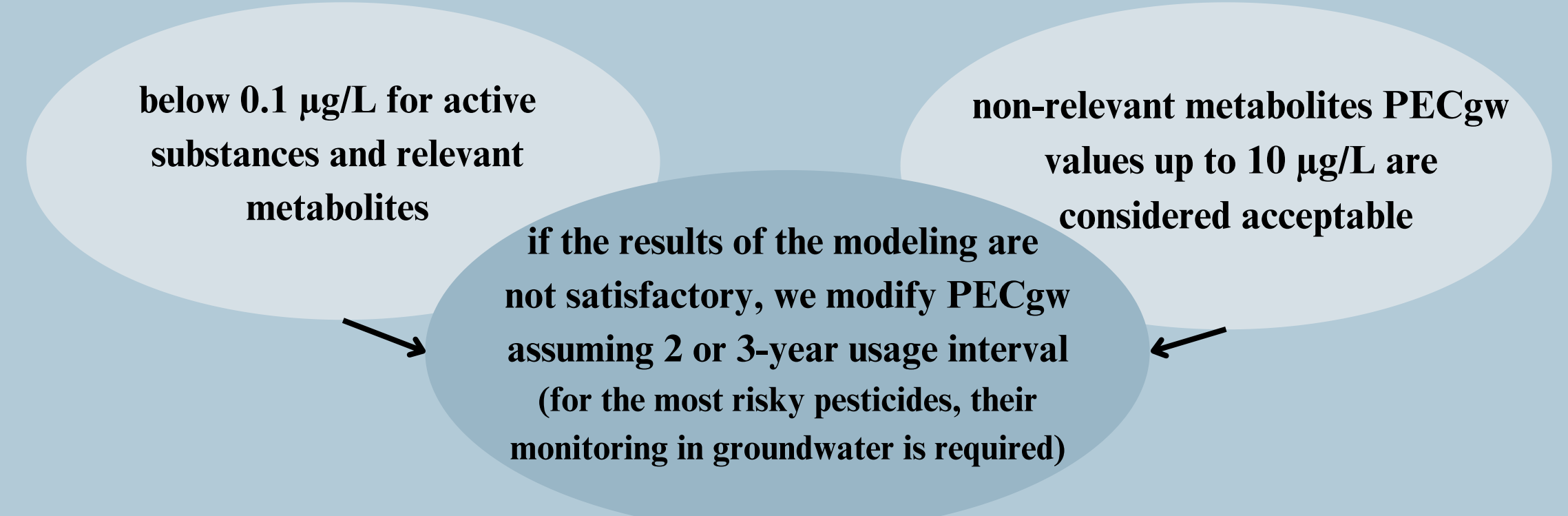


Spread sheet calculator for PEC<sub>soil</sub> and accumulation in soil

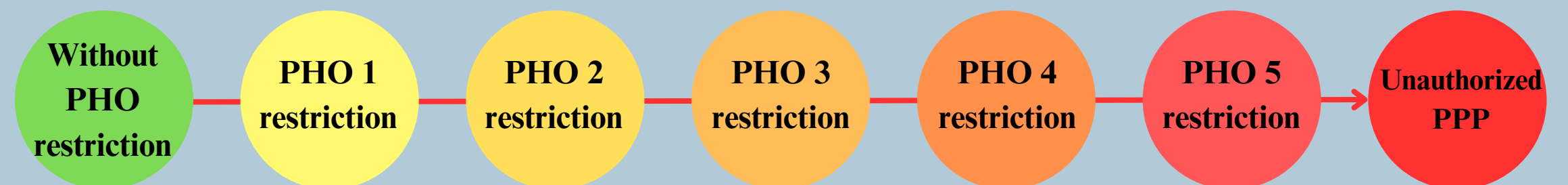


Plant interception is timed with the crop's growth stage (EFSA, 2014a). For annual crops, PECs considers long-term accumulation, factoring in annual mixing within the top 20 cm (ploughing layer).

In order to demonstrate safe use conditions the PEC<sub>gw</sub> has to be (in all national FOCUS groundwater scenarios):



For protection zones of water sources (i.e. sources of drinking water), according to Decree no. 488/2011 Coll. of the MARD of the Slovak Republic, which lays down details on principles and measures for the protection of human health, sources of drinking water, bees, game, aquatic and other non-target organisms, the environment and special areas with the use of plant protection products, were defined national measurements for the protection of drinking water according to an approved classification based on a risk assessment. They restrict and prohibit the use of plant protection products in protection zones of groundwater and surface water used for drinking purposes as follows (from the least strict measure to the most strict):



Example of the content of individual restrictions:

PHO1 - Products are excluded from use in the inner part of a 2nd protection zone to protect sources of groundwater and surface water.

PHO5 - Products are excluded from use in the entire 2nd protection zone of groundwater and surface water sources and in the 3rd protection zone of water reservoirs; The product is not allowed to be applied near settlements supplied with water from the wells, product is not allowed to be used on land intended for the cultivation, including cultivation of crops used for baby food production and on land with organic farming, where application can be allowed in accordance with the local conditions in a dose corresponding to the lower limit of the authorized range. It cannot be applied on the land that is sloping to a watercourse and water reservoirs.

