5.1. Environmental fate

The classification and interpretation schemes we apply are given below. Please note other systems may exist and may differ.

Parameter	Source	Thresholds
Solubility in water (mg l^{-1} or ppm)	Based on Ney, R.E. (1995). *Fate and Transport of Organic Chemicals in the Environment.* Rockville, Md.: Government Institutes (p. 10).	<= 10 = Low 10 – 1,000 = Moderate > 1,000 = High
Vapour pressure at 25°C (mPa)	Based on that used within EFSA Guidance documents e.g. 'Guidance on the assessment of exposure of operators, workers, residents and bystanders in risk assessment for plant protection products, EFSA journal 2014;12(10):3874.	< 5.0 = Low volatility 5.0 – 10.0 = Moderately volatile > 10 = Highly volatile
Henry's Law Constant (Pa m^3 mol^{-1})	Rule of thumb in wide, general use.	> 100 = Volatile 0.1 - 100 = Moderately volatile < 0.1 = Non-volatile
Octanol-water partition coefficient (Log P):	Used by the US EPA. Widely used rule of thumb.	< 2.7 = Low bioaccumulation 2.7 – 3 = Moderate > 3.0 = High
Soil degradation (days)	See note 1.	< 30 = Non-persistent 30 - 100 = Moderately persistent 100 - 365 = Persistent > 365 = Very persistent
Aqueous photolysis DT50 (days at pH 7)	See note 5.	< 1 = Fast 1 - 14 = Moderately fast 14 - 30 = Slow > 30 = Stable
Aqueous hydrolysis DT50 (days at 20°C and pH 7)	See note 5.	< 30 = Non-persistent 30 - 100 = Moderately persistent 100 - 365 = Persistent > 365 = Very persistent
Water-sediment degradation (days)	Same thresholds as soil degradation utilised. See note 1.	< 30 = Fast 30 - 100 = Moderately fast 100 - 365 = Slow > 365 = Stable
Water phase only degradation (days)	See note 5.	< 1 = Fast 1 - 14 = Moderately fast 14 - 30 = Slow > 30 = Stable
K_{oc}/ K_{foc} (ml g^{-1})	PSD Pesticide Data Requirement Handbook (2005). SSLRC Mobility	< 15 = Very mobile 15 - 75 = Mobile

	Classification System. Also See note 5.	75 - 500 = Moderately mobile 500 - 4000 = Slightly mobile > 4000 = Non-mobile
Freundlich equation	See note 9.	
GUS Index	Gustafson, DI (1989) Groundwater Ubiquity Score: a simple method for assessing chemical leachability. Environ. Toxicol. Chem 8, 339-357.	> 2.8 = High leachability 2.8 - 1.8 = Transition state < 1.8 = Low leachability
SCIGROW indicator	See note 8.	
Particle bound transport indicator	Goss & Wauchope (1990). See note 3.	
Bio-concentration factor	General rule of thumb and that used by the US EPA.	< 100 = Low potential 5000 – 100 = Threshold for concern > 5000 – High potential

Notes

1. Consistent with EU Guidance. (9188/VI/97 rev. 8.) and

    I. Kerle EA, Jenkins JJ & Vogue PA (1996), Understanding pesticide persistence and mobility for groundwater and surface water protection. Oregon State University. EM 8561.

    II. Rao PSC & Hornsby AG (2004) Behaviour of pesticides in Soils and water. University of Florida. See http://edis.ifas.ufl.edu/SS111.

    III. See also Note 3 below.

2. Several relevant references which include:

    I. Van der Werf , HMG (1996) Assessing the impact of pesticides on the environment. Agriculture, Ecosystems & Environment, 60, 81-96.

    II. Jury WA, Spencer WF, & Farmer WJ (1984) Behaviour assessment model for trace organics in soil. III Application of screening model. J. Environ Qual. 13, 573-579.

    III. Kerle EA, Jenkins JJ & Vogue PA (1996) Understanding pesticide persistence and mobility for groundwater and surface water protection. Oregon State University. EM 8561.

3. Table below has been extracted from:

    I. Goss, D & Wauchope RD (1990) The SCR/ARS/CES Pesticide Properties Database. II using it with Soils data in a screening Procedure. In D.L. Weigmann Ed., Pesticides in the next decade: the challenge ahead, Virginia Resources Research Centre, Blacksburg, VA, USA pp471-493.

Potential for Particle-bound transport	Criteria
High	DT50 >= 40 days & Koc >= 1000 DT50 >= 40 days, Koc >= 500 & solubility <= 0.5 mg/l

Low	DT50 <= 1 day DT50 <= 2 days & koc <= 500 DT50 <= 4 days, Koc <= 900 & solubility >= 0.5 mg/l DT50 <= 40 days, Koc <= 500 & solubility >= 0.5 mg/l DT50 <= 40 days, Koc <= 900 & solubility >= 2 mg/l
Medium	All other

4. Classification given below has been extracted from the WHO Guidelines document: The WHO recommended classification of pesticides by hazard & guidelines to classification. (2004). See http://www.who.int/publications/en/

    - Class Ia: extremely hazardous
    - Class Ib: highly hazardous
    - Class II: moderately hazardous
    - Class III: slightly hazardous
    - O: Obsolete
    - NL: Not listed

5. Thresholds used have been selected to be consistent with industry guidelines, were developed, and are consistent with regulatory thresholds used in both the UK and EU. Alternative classification systems are in use. In particular, that published by the FAO (https://www.fao.org/3/X2570E/X2570E06.htm) may be useful.

6. The EU (Uniform Principles) (Annex VI of Directive 91/414/EEC) guidelines have been adopted have set toxicity:exposure (TER) ratios for algae and aquatic plants at 1/10th of those for fish and daphnids. The same ratio has been applied here.

6a Algae growth tests can provide both acute and chronic endpoints due to the rapid growth of most algae species. Typically, four endpoints may be reported from the study: ErC50, EbC50, ErC10 and NOEC. Within the PPDB we report acute algae growth endpoints as EC50 or ErC50. However, biomass (EbC50) or yield (EyC50) data may be reported in the absence of growth rate data. Similarly we report chronic algae growth endpoints as NOEC or ErC10. It is the end users choice how these endpoints are categorised within risk assessments.

7. In EU pesticide regulatory risk assessments ‘hazard quotients’ are used to determine the need for additional studies to assess risk to beneficial arthropods. Hazard quotients (HQ) are determined by dividing the Predicted Environmental Concentration (PEC) of the active substance by the median lethal rate (LR50). HQ values less than 2.0 are considered to be low risk to beneficial arthropods and additional (higher tier) data are not required. Values greater than 2.0 trigger additional data requirements. As the PEC is not known we are unable to provide an interpretation.

8. SCI-GROW is a screening model used by the US EPA to estimate pesticide concentrations in vulnerable groundwater. The model provides an exposure value that can be used to determine the potential risk to the environment and to human health from drinking water contaminated with the pesticide. The SCI-GROW estimate is based on environmental fate properties of the pesticide (aerobic soil degradation half-life and linear adsorption coefficient normalised for soil organic carbon content), the maximum application rate, and existing data from small-scale prospective ground-water monitoring studies at sites with sandy soils and shallow ground water.

    SCI-GROW estimates represent worse case estimates. For this reason, it is not appropriate to use SCI-GROW concentrations for national or regional exposure estimates. Nor is this indicator an alternative to a scientific risk assessment. Values given are based on a standard 1 kg ha^{-1} or 1 L ha^{-1} application rate and should be adjusted to the actual application rate used

For more information see: http://www.epa.gov/oppefed1/models/water/scigrow_description.htm.

9. The distribution of a pesticide between the solution and absorbed phases can often be described by the "Freundlich equation", an equation that is used to describe a wide variety of adsorption data from every area of science. The equilibrium concentration and adsorbed pesticide amounts are determined experimentally. The Log10 of the quantity of adsorbed pesticide is plotted against the equilibrium concentrations. Often the relationship obtained is approximately linear and can be described by the Freundlich equation: Q=KC1/n, where Q is the adsorbed amount of pesticide (µg kg-1), C is the equilibrium concentration (µg l-1), and kf and n are the experimental parameters unique to the isotherm. The parameter n is greater than 1, the larger it is the more non-linear the equation becomes.

10. The availability of the pesticide in the soil can depend on the amount of soil organic carbon (SOC). The toxicity endpoint value may therefore be corrected for the difference in SOC of the test soil and the reference soil. This means that the toxicity endpoint value is divided by the percentage organic matter in the standard test soil and multiplied by the percentage organic matter in the reference soil. Uncorrected values are quoted herein unless otherwise stated e.g. '(corr)'.

11. Data is very limited and is presented in the literature in a variety of formats. Therefore, neither a standard format nor interpretation can be provided.