

# Ecological models in chemical risk assessment – Recommendations of the SETAC workshop MODELINK

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## 1. Introduction

Recently a framework was developed based on the 'ecosystem services approach' for deriving specific protection goals for environmental risk assessment of pesticides [1]. Within this framework ecological modelling is identified as a promising tool to link the results of ecotoxicological studies to such specific protection goals because it can facilitate extrapolation from standard test endpoints to higher levels of biological organization and can explore the influence of various kinds of ecological complexity on the degree of risk.

However, currently there are no recommendations on which models are suitable or how to apply them to risk assessments. Therefore, the general objective of the SETAC Europe technical workshop MODELINK is to provide guidance for when and how to apply ecological models to regulatory risk assessment.

In particular, the following questions will be answered:

- How to translate protection goals (taking the new specific protection goals based on ecosystem services as a working example) into workable problem formulations?
- What are the relevant scenarios that cover risk assessment questions in terms of species choice (e.g. focal, surrogate or indicator species) and spatial and temporal scales?
- What are criteria for deciding whether ecological models can improve risk assessment for a case at hand, e.g. when standard data cannot answer the risk assessment questions but ecological models can?
- How to choose the model type to be used to link standard/higher tier test data to protection goals?
- How to use ecological model outputs in regulatory risk assessment?

## 2. Workshop organisation

The focus of MODELINK is on the risk assessment of plant protection products, and the main groups of organisms covered in EC Reg 1107/2009 and the EFSA opinion on specific protection goals are considered in case studies, i.e. macrophytes, aquatic invertebrates, fish, soil invertebrates, non-target arthropods, as well as birds and mammals. Models used cover toxicokinetic/toxicodynamic (TKTD) and population models of different complexity.

Approximately 60 experts from diverse backgrounds (ecotoxicologists, modellers, regulatory scientists and policy makers) and representing the tripartite structure of SETAC (Academia, Business, Government) participated upon invitation.

The workshop is divided into two meetings each over 3 – 4 days and a homework period in between to work within breakout groups on the case study reports. The first meeting was held in October 2012, the second one will be in April 2013. Thus, results will be available before the SETAC annual meeting in Glasgow.



Figure 1: MODELINK schedule.

### 3. Results

After a few keynotes introducing the background and objectives of the workshop the participants worked in breakout groups on 6 case studies:

1. Organism-level effects in vertebrates
2. Population-level effects on small mammals
3. Population-level effects on soil invertebrates
4. Population-level effects on terrestrial arthropods
5. Population-level effects on aquatic invertebrates
6. Population-level effects on macrophytes

After presenting the available exposure and (experimental) effect data the 'classical' risk assessments and options for refinements via ecological models were discussed. Fifteen different models were introduced by the modellers and made available for the participants to be used during the homework period. First experience with handling the models and conducting simulations was gained in the breakout work. Discussions in the plenary revealed that there is a shared view on the potential of ecological modelling as a risk assessment tool. However, there was a general wish to clarify the risk assessment issues that modelling may actually address, to understand the needs of modelling as regards data, and to build confidence in the use of modelling to support decision making. It was concluded that models can quantify toxicant impacts, but cannot necessarily tell us what acceptable impacts are. Thus, there is still the need to define the specific protection goals in a way that they can guide the definition of model scenarios and outputs. Until then, the models should be used to support the analysis of scenarios related to different levels of protection; the models should be realistic while the scenarios should cover relevant, realistic worst-case situations. To increase confidence in models and their use the development of standardized effect models, similar to the FOCUS exposure models, was suggested.

### 4. Outlook

During the homework period the groups will prepare risk assessment reports on their case studies comparing 'classical' risk assessments to those using ecological effect models. These reports will be discussed and refined during the second meeting and serve as the basis to derive general recommendations on the use of effect models in pesticide risk assessment which will be presented.

### 5. References

- [1] EFSA Panel on Plant Protection Products and their Residues (PPR); Scientific Opinion on the development of specific protection goal options for environmental risk assessment of pesticides, in particular in relation to the revision of the Guidance Documents on Aquatic and Terrestrial Ecotoxicology (SANCO/3268/2001 and SANCO/10329/2002). EFSA Journal 2010;8(10):1821. [55 pp.] doi:10.2903/j.efsa.2010.1821. Available online: [www.efsa.europa.eu/efsajournal.htm](http://www.efsa.europa.eu/efsajournal.htm)

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