EUROPEAN CHEMICALS AGENCY

Topical Scientific Workshop on Risk Assessment for the Sediment Compartment

7-8 May 2013, Helsinki, Finland

CASE STUDY – SUMMARY FORM

4

(Number to be filled by the organisers)

The case studies covering concrete examples of sediment risk assessments for particular chemicals and/or conditions are intended to support the breakout group discussions. All submitted case studies will be distributed to the participants as supporting background material for the workshop and will be included in the workshop proceedings. The Scientific Committee will select some case studies or selected areas of the case studies and will invite the authors to present these cases during the workshop, either at the plenary session or during the break-out groups.

NOTE: By submitting this form, the authors confirm that they have the ownership of the information presented in the case study and that they authorise ECHA to distribute the submitted information to the workshop participants and to publish it in paper and/or electronic format as part of the workshop proceedings.

Contact details for the submitter

Last name: Liess	First name: Matthias
Email: matthias.liess@ufz.de	
Tel: +49 341 3928 1727	
Organisation/Company: UFZ - Helmholtz-Zentrum für Umweltforschung GmbH	
Country: Germany	

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Case study details

Case study is particularly relevant for the subthemes:
Note: the case study should cover all three areas, but please indicate if it is particularly relevant/informative for one or more subthemes

	Problem definition and conceptual model for sediment risk assessment
	Exposure assessment
X	Effect assessment

Authors: Matthias Liess
Title:PD Dr.
Keywords:
Summary: A framework to assess ecological risks of chemical substances need to be based on an understanding of relevant mechanisms governing field effects. This includes exposure routes and environmental conditions governing effects and recovery. For this a multitude of processes need to be prioritised and simplified. The challenge is to strive a balance between realism and reduction of complexity to perform a retrospective- and prospective risk assessment. The framework suggested for this case study is the SPEAR approach. It has been validated worldwide for retrospective risk assessment for pesticides in various geographical regions (Australia, France, Switzerland, Germany, Austria, Sweden, Finnland). Recently the approach has been adopted for prospective risk assessment as well. Currently it is in the process of inclusion into the new aquatic guidance document developed by the EFSA. Further development includes adaptation of the approach to various classes of toxicants (metal toxicity is in development) and to a wider range of ecosystems. Additionally the usability for prospective risk assessment will be enhanced. Currently a internet based application for pesticide risk assessment is available (http://www.systemecology.eu/spear/).

Poster exhibition
The case study will be presented also as a poster

X Yes   ☐ No

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1. BACKGROUND AND PROBLEM DEFINITION

a. Aim is to identify and predict community alteration following toxicant exposure. The change in community will be described as trait composition [1]. This is for example the proportion of sensitive, long-living taxa based on the ecological knowledge that especially time varying exposure is favouring short-living insensitive taxa. Also other relevant traits as feeding groups, body size, and sediment association will be used to characterise trait composition of communities. The advantage of such a trait based approach is that (i) trait composition can be linked with mechanistically based ecotoxicological effects. (ii) the approach is geographically independent as trait composition does not depend on single species [2] (iii) the approach has been applied in various geographical regions all over the world and has proved to be efficient. The disadvantage of trait based approaches is that effects are not associated to specific species.
b. The SPEAR approach has been identified as suitable for pesticide risk assessment on the EU/SETAC workshop EiPf (Effects of pesticides in the field, [3]) and is currently included within the legal and regulatory context of the EU directive on pesticides: 1107/2009 [4].

2. MAIN CASE STUDY DESCRIPTORS

a. SPEAR (Species At Risk) is a trait based approach that links specific environmental stress and community composition. The approach analyses those characteristics of species traits that are shaped according to the ecological requirements of a specific stressor. This analyses provides a quantitative assessment of the magnitude and the ecological effects of stressors.

3. CONCEPTUAL MODEL

a. The SPEAR approach can be used for retrospective risk assessment (RA) and prospective risk assessment. Within the retrospective RA a link between exposure and community in the wild can be established. This is used to identify relevant ecotoxicological process and to validate prospective RA. Within the prospective RA prediction of toxicant effects will be made on the basis of traits known to be responsive to the typical scenarios of exposure.

b. The following figure shows a graphical representation of the SPEAR approach.

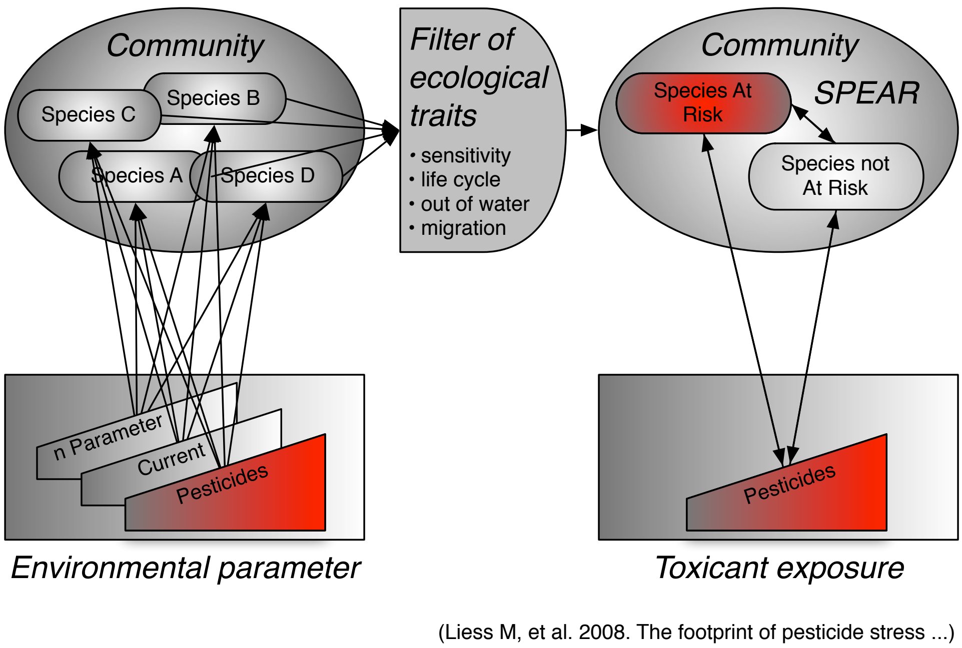

Figure 1: SPEAR approach. A multitude of environmental parameters is shaping the community. The description of Community will be done after a „filter" of relevant traits. The resulting trait composition can be associated to toxicant exposure (pesticides in this example) [5].

4. EXPOSURE ASSESSMENT

a. **METHODOLOGY:** Exposure is characterised according to exposure profile [6]. In agricultural streams, for example, exposure is typically short-term. Hence, event controlled sampling devices need to be employed.
b. Also passive samplers are possible to identify time varying exposure [7-10].
c. Additionally sediment and suspensions are relevant to be characterised [11].
d. Another approach is to model exposure. This approach is characterised by a reduced accuracy but in turn is able to identify exposure of extended geographical areas [12,13].
e. **RESULTS:** As a result of the above mentioned approaches a the description of peak exposure is possible.

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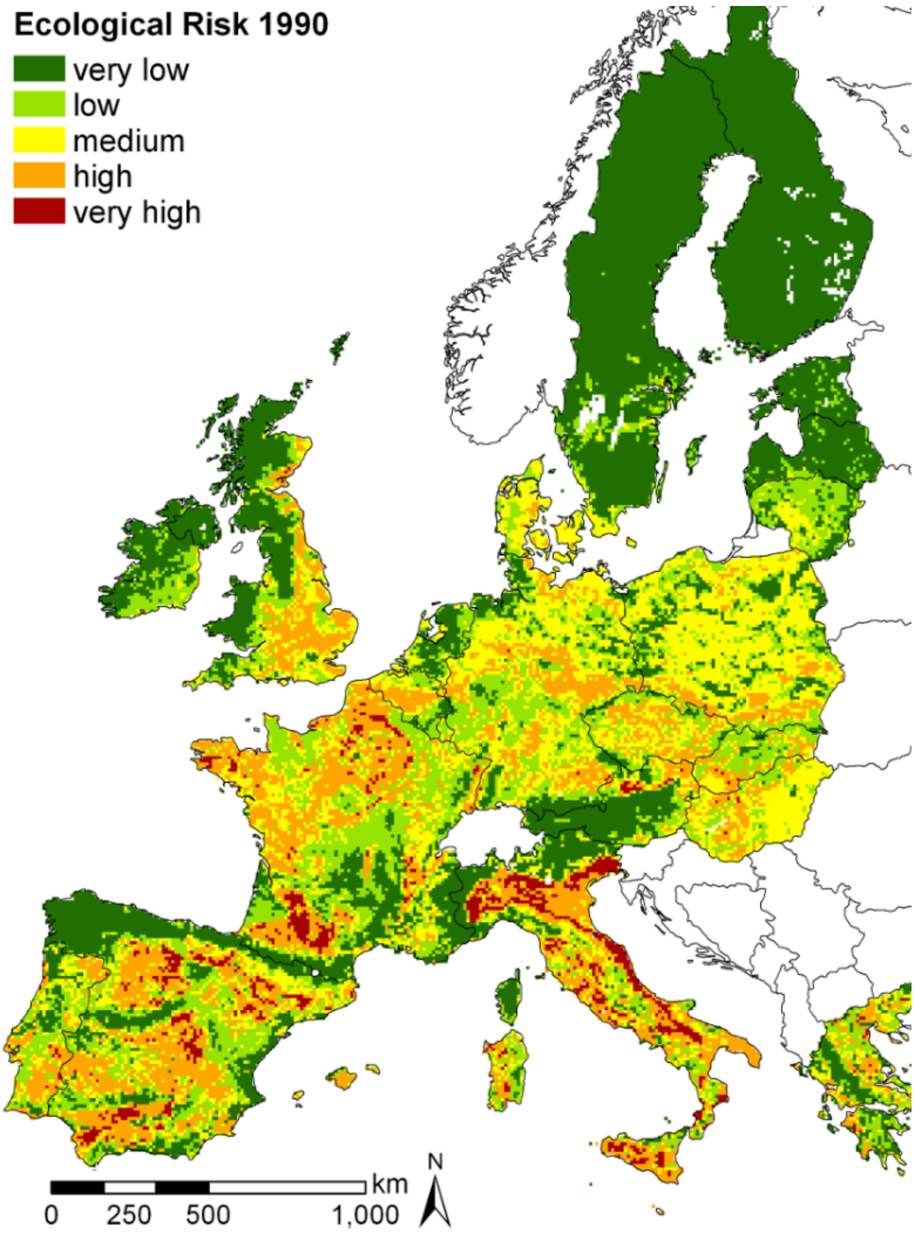
5. EFFECT ASSESSMENT

a. **METHODOLOGY:** Ecological receptors are aquatic invertebrates.
b. For a retrospective risk assessment trait combinations of the invertebrates present in aquatic systems will be evaluated [1]. These includes all traits that are sensitive to toxicant exposure.
c. A free online web resource is available to calculate effects based on invertebrate sampling data as for example obtained by the WFD (http://www.systemecology.eu/spear/).
d. For a prospective risk assessment first the target community is defined in terms of trait composition. Then information of sensitivity of species towards the respective toxicants will be identified. In case a multitude of toxicant with different modes of action are expected a relative species sensitivity ranking (RSD) will be performed. The ranking is available for freshwater species [14,15] and could be obtained for salt water species as well.
e. Ecological traits of the target community is determined and ecotoxicological relevant parameters as time for recovery are derived.
f. A free online web resource is available to calculate effects based on mesocosm data (http://www.systemecology.eu/spear/). The underlying investigation is described in [16].
g. Quality criteria derivation and PNEC values can be derived based on on WFD quality classes [17].
h. **RESULTS:** The outcome of the effect assessment will be a differentiated assessment of effects on trait combinations. For example, what are effects on vulnerable species (i.e. toxicological sensitive and long-living). And what are effects on robust species (i.e. toxicological in-sensitive and short-living).

6. RISK CHARACTERISATION & CONCLUSIONS

a. **METHODOLOGY:** Please describe briefly the main elements of the risk characterisation (e.g. lower/higher tier, risk maps or other geo-referred approaches, deterministic/probabilistic), the metrics (risk quotients, quantitative likelihood estimations, qualitative likelihood estimations, risk expressions indicating the magnitude and likelihood of the expected impact, etc.), uncertainty and variability assessments, how ecological processes such as recovery, re-colonisation, resilience, redundancy, etc. were accounted for.
b. Risk characterisation is performed with higher tier approaches

c. Risk maps can be derived as done for Europe [18].



d. **RESULTS:** Outcome of the risk assessment is a gradual representation of risk that can be expressed in a five classes according to Th. eWFD [17].
e. Risk communication will include
   i. Validation of prospective risk assessment applying retrospective risk assessment in order to build trust that risks are being adequately assessed and managed.
   ii. The strong link of SPEAR to other EU regulations as the pesticide directe and the water framework directive will enable a smooth implementation of risk management policies.
   iii. Relating to effects in the wild helps to bridge the gap between real risks and perceived risks.

7. REFERENCES:

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