

Iterative adaptive monitoring to close the gaps in current risk assessment

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Chemical products such as Plant Protection Products should have no unacceptable impacts on non-target organisms, biodiversity or the ecosystem (Regulation EC No 1107/2009 (EU 2009)). Within Risk Assessment for soil organisms, there are several gaps in the knowledge enabling the fulfilment and control of these requirements. From an ecological perspective there is currently, a lack of interrelations between the lab toxicity testing and the corresponding effect patterns in the field. Below we will give a brief overview of present gaps and present a conceptual approach to meet the demands.

Effect level (laboratory)

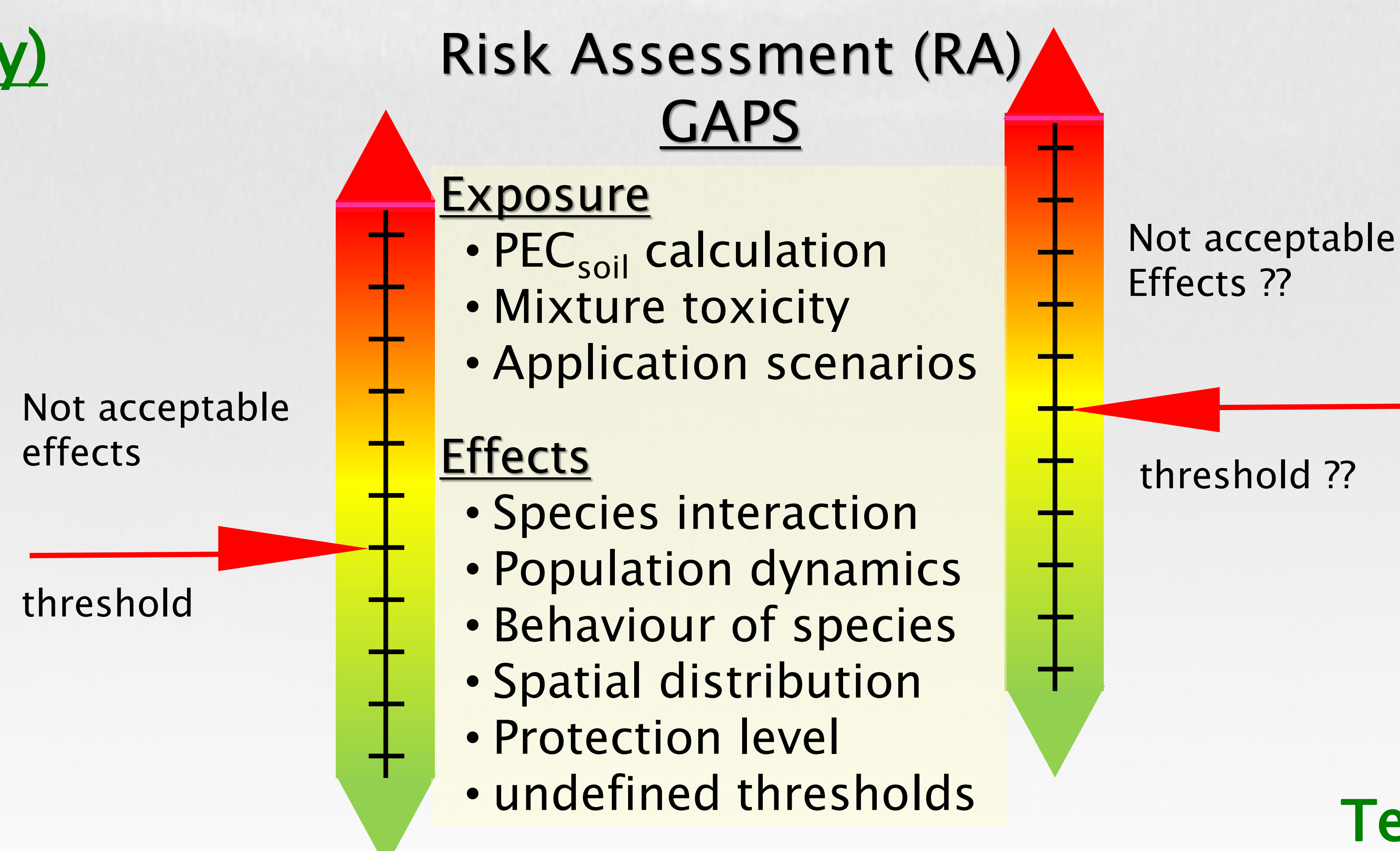
Earthworms
Eisenia fetida/ E. andrei

Collembolans
Folsomia candida

Gamasid mites
Hypoaspis aculeifer

Risk Assessment (RA)

GAPS



Soil community (field)

Collembolans

Oribatid mites

Earthworms & Enchytraeids

Nematodes

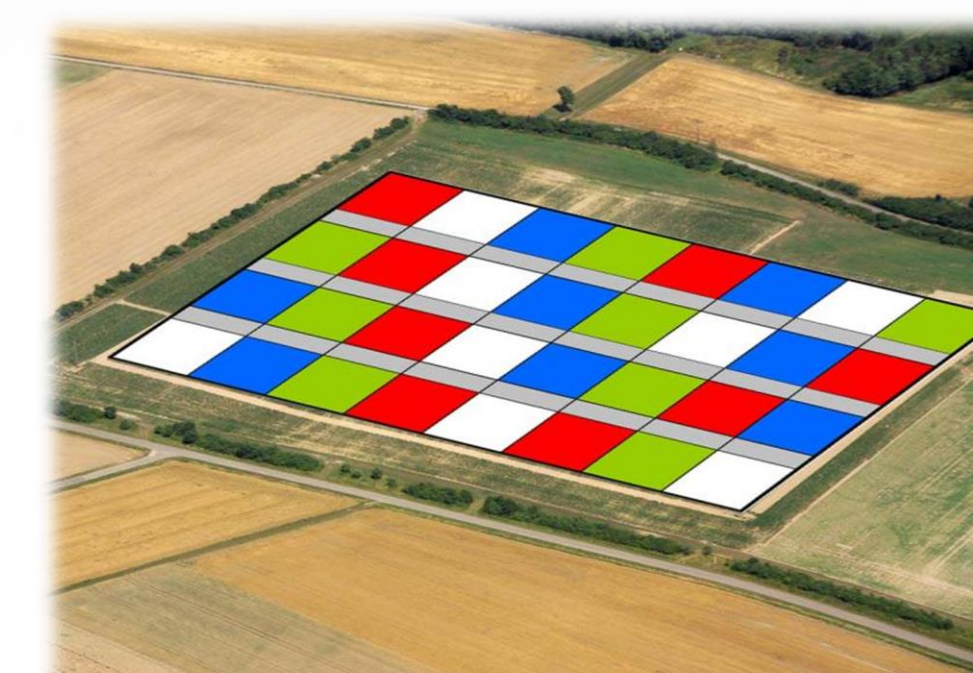


Tests on natural communities

involve interaction, behaviour of species etc.

Field trials

- Advantages:*
- Natural conditions
 - Natural community
- Disadvantages:*
- Natural variances



Terrestrial Model Ecosystem (TME)

- Advantages:*
- Lower variances in species abundance
 - Reduced variability of environmental conditions
 - Measurement of percolation
 - Reduced land consumption



To be able to assess the risk of detrimental effects of chemical products on soil communities in the field, the different scales of ecotoxicological testing should be set in an adequate relationship to each other thus closing these gaps (Fig. 1). Reference values (good ecological value) as minimum standard should be defined based on field studies to be able to assess acceptable and unacceptable effects. Terrestrial Model Ecosystems (TME) as a 'semi-field' approach can help to survey the impact on communities under defined conditions and low variance. Effects in the field community can be measured and set in relationship to the effect-levels found in lab studies.

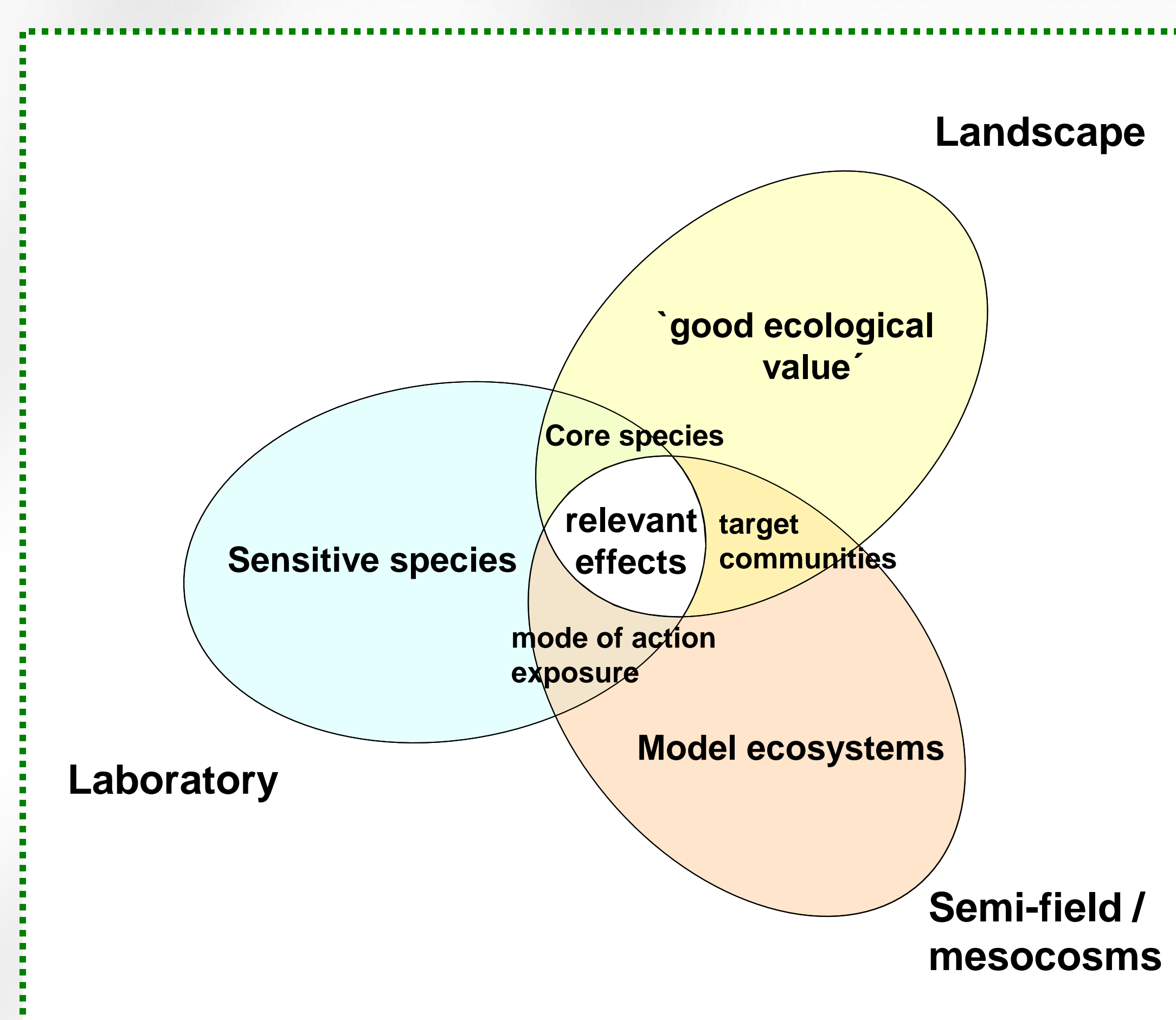


Fig. 1 Interrelation between the different scales in tiered Risk Assessment (Toschki 2008)

To control the efficacy of prospective RA and in abundance with EU regulation, a retrospective validation via monitoring in the field is mandatory. References to evaluate soil health could be defined e.g. based on central soil databases (EDAPHOBASE, Burkhardt et al. 2014). Concepts are given by Toschki 2008 (Fig.2) and Römbke et al. 2012. The monitoring can help to define natural thresholds for unacceptable effects including natural variances. If prospective and retrospective RA were to be interrelated as described above, collected data on soil organism communities could be used to develop models to calculate effect patterns of complex scenarios for the arable landscape.

References:
Burkhardt, U., Russell, D. J., Bury, R., Decker, P., Döhler, M., Höfer, H., Lesch, S., Rick, S., Römbke, J., Trog, C., Vorwald, J., Wurst, E. & Xyländer, W. E. R. 2014: The Edaphobase Project of GBIF-Germany – A new online soil-zoological data warehouse. 2014. Applied Soil Ecology.
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Toschki A (2008): Eignung unterschiedlicher Monitoring-Methoden als Grundlage zum Risk-Assessment für Agrarsysteme – Am Beispiel einer biozöologischen Reihenuntersuchung und einer Einzelfallstudie – Dissertation, RWTH-Aachen.

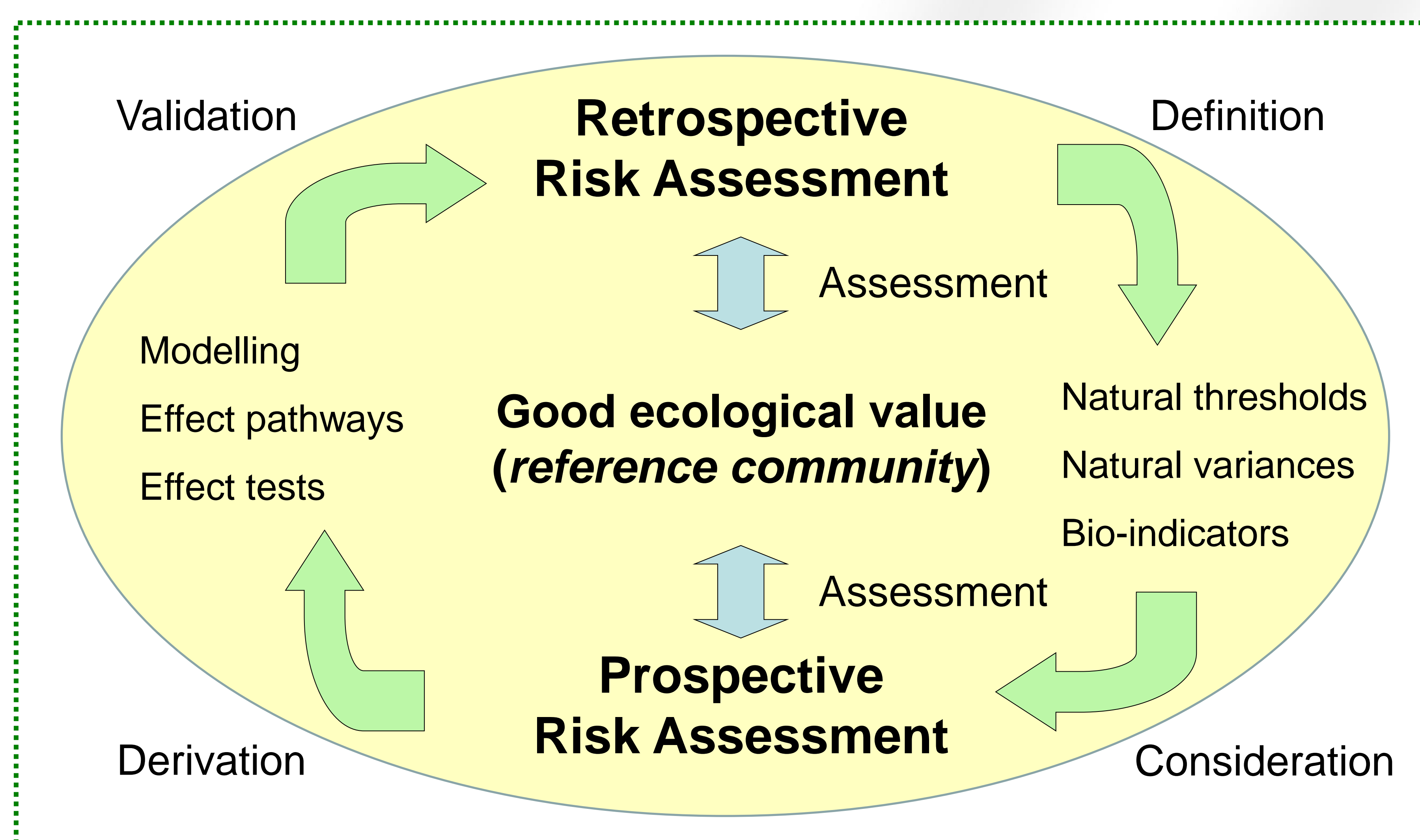


Fig. 2 Interrelation between different scales in tiered Risk Assessment (Toschki 2008)