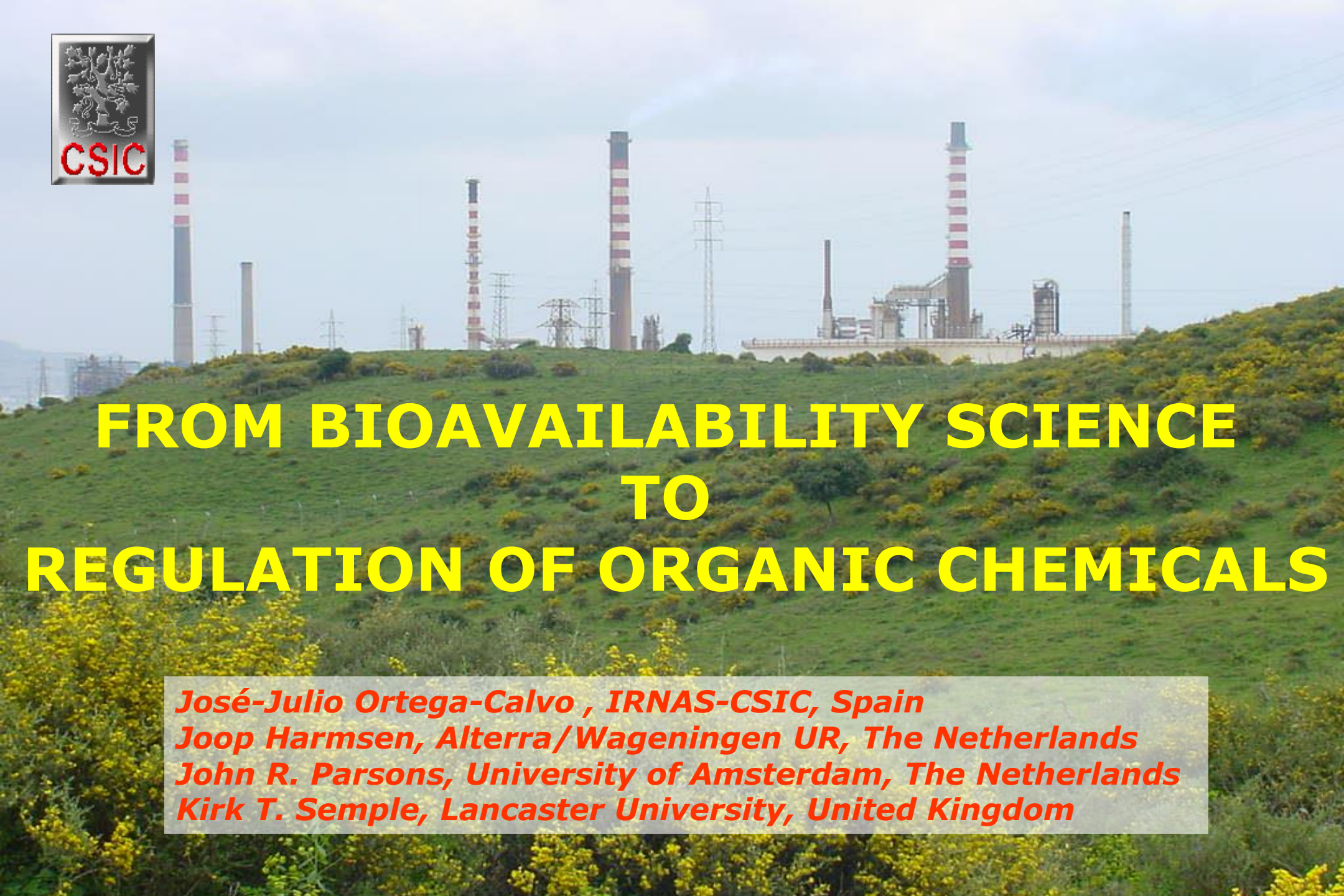

FROM BIOAVAILABILITY SCIENCE TO REGULATION OF ORGANIC CHEMICALS

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Joop Harmsen, Alterra/Wageningen UR, The Netherlands
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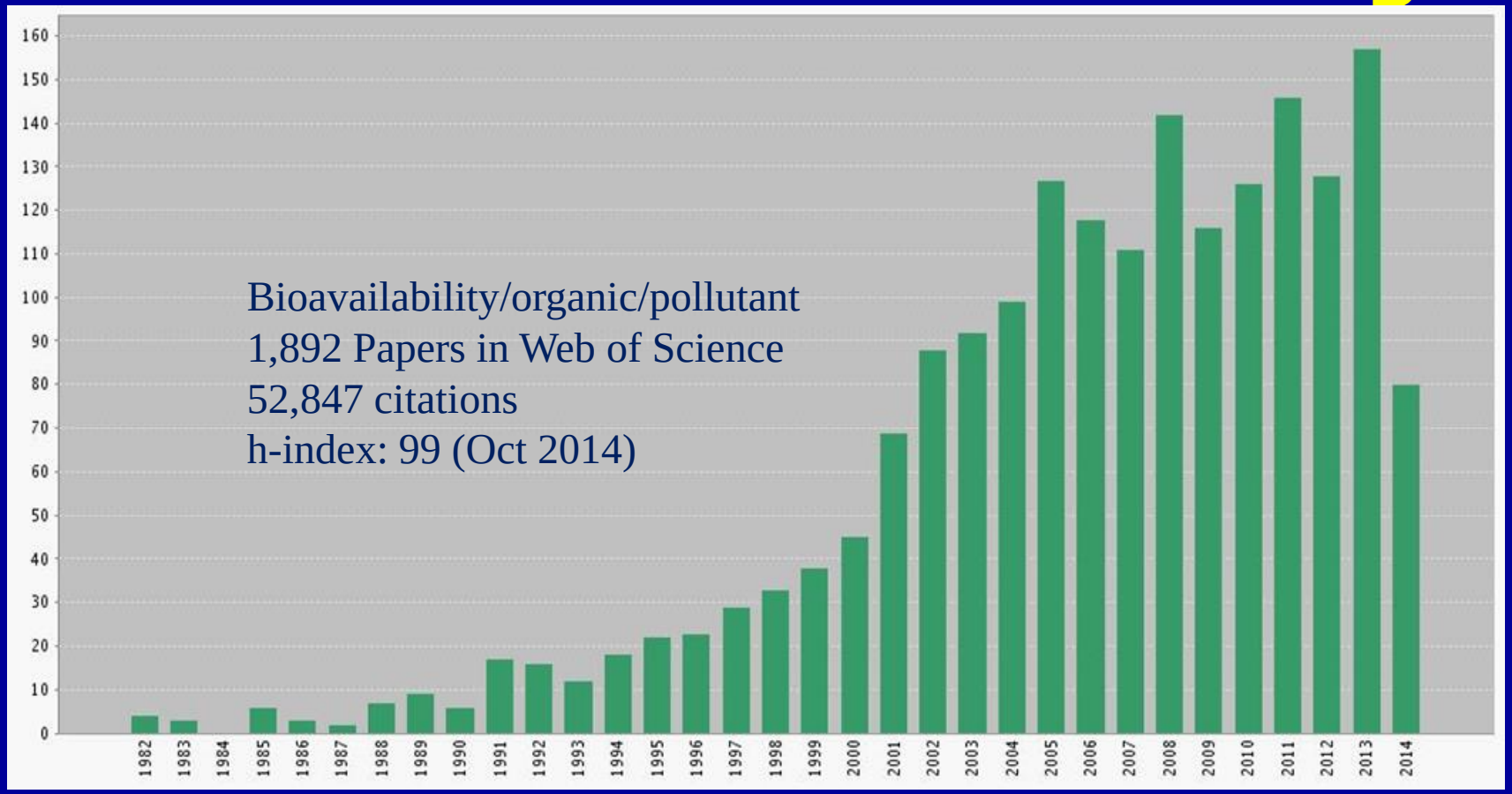
Does science know enough?



Application of bioavailability in regulation and soil management is limited

How can we make the step

- Belief that **science** on bioavailability of organic chemicals is mature enough to be used by **REGULATORS** and **INDUSTRY**. **BRING THEM TOGETHE**R
- The main objective of the Symposium is to identify and provide **solutions** to the problems faced by **users** in handling bioavailability concepts during risk assessment and regulation of **organic** chemicals.
- Implications for **authorisation** of chemicals (REACH), **soil & sediment** regulation, **remediation** industry.

SESSS10 OUTPUT

- SESSS10 website updates with presentations, wrap-up sessions (Google: SESSS10)
- Session in Barcelona SETAC Europe AM
- Position paper to be published in 2015

ES&T (2015) 49, 10255-10264

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From Bioavailability Science to Regulation of Organic Chemicals

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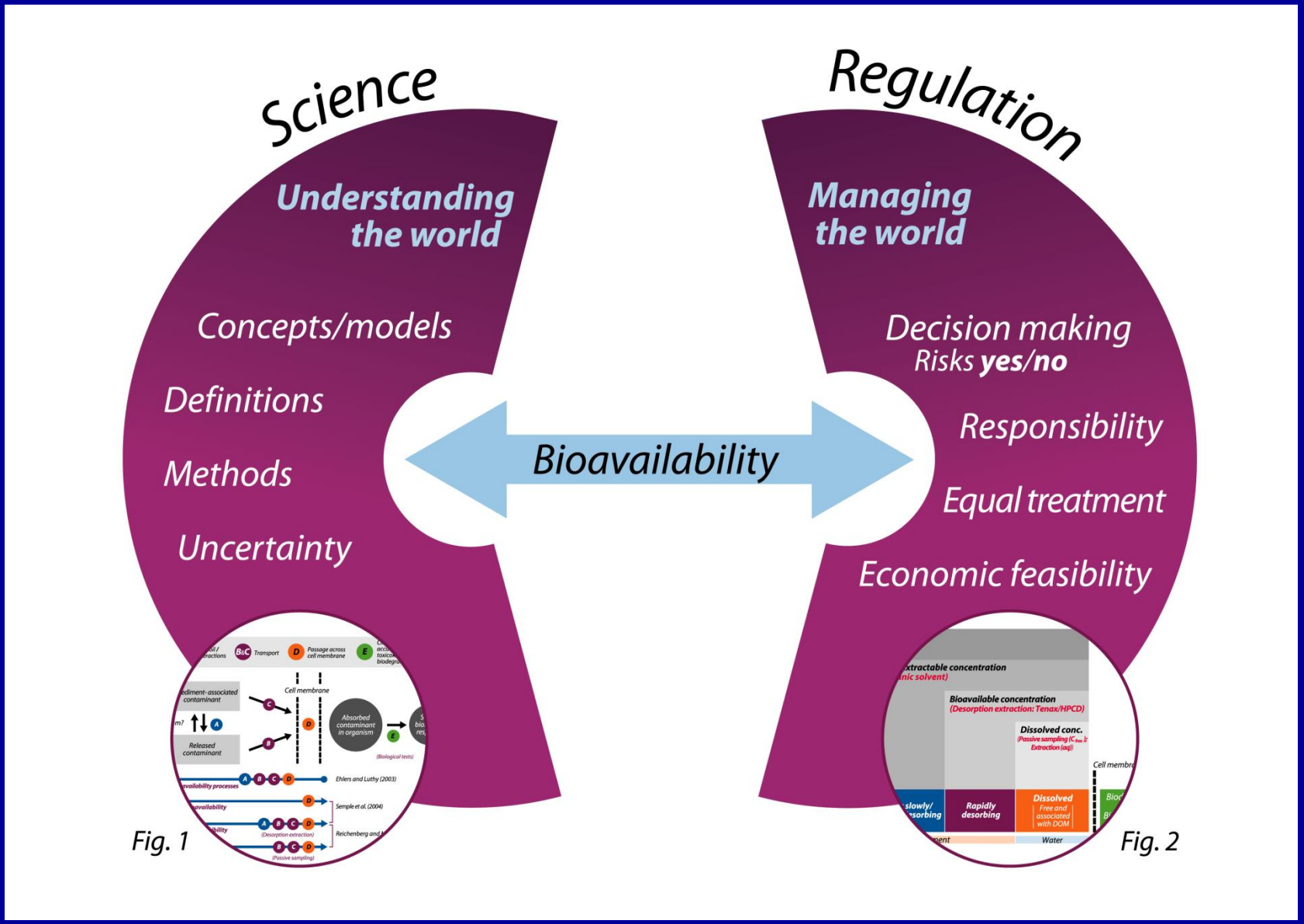
Bringing different worlds together



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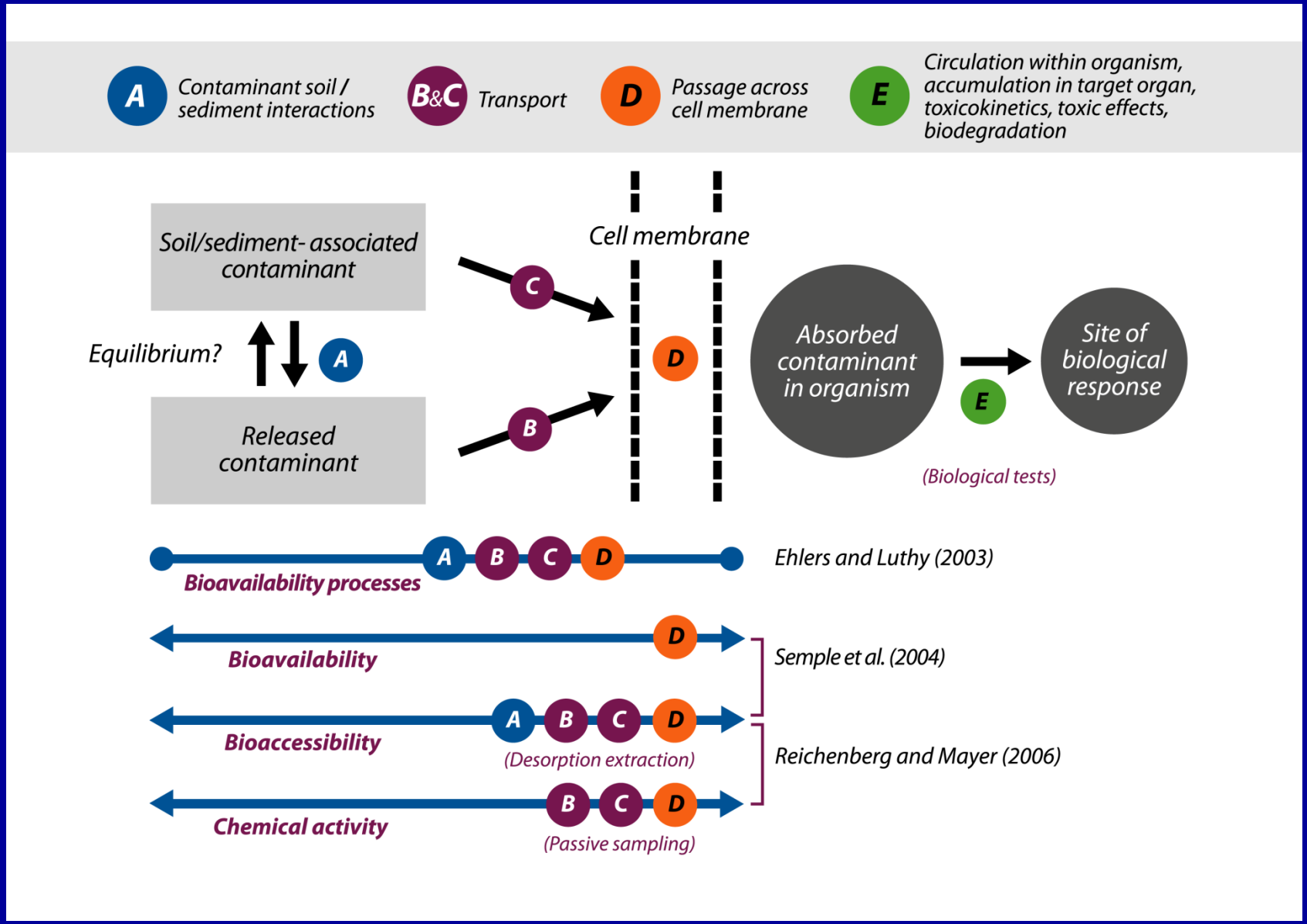
Bioavailability Science



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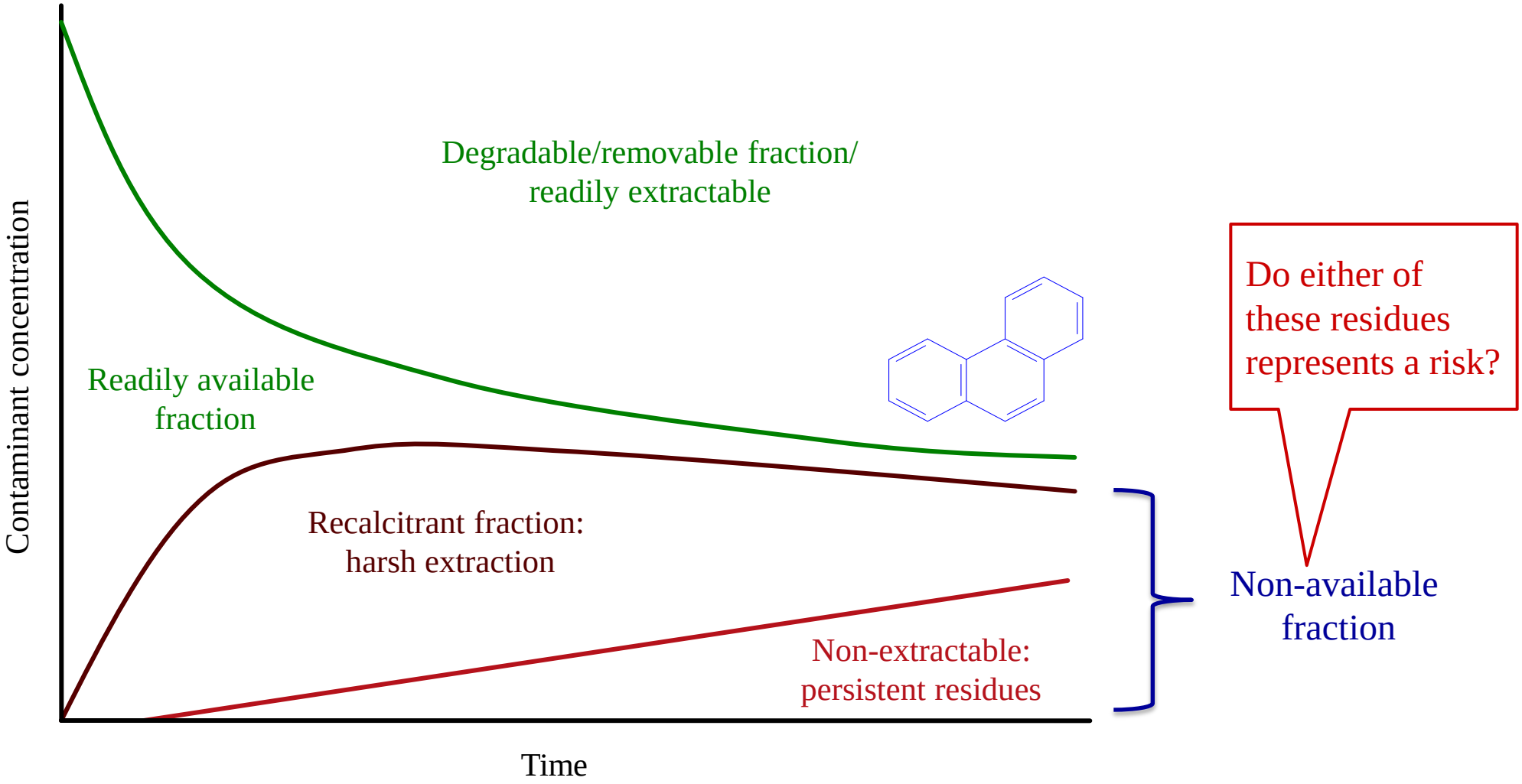
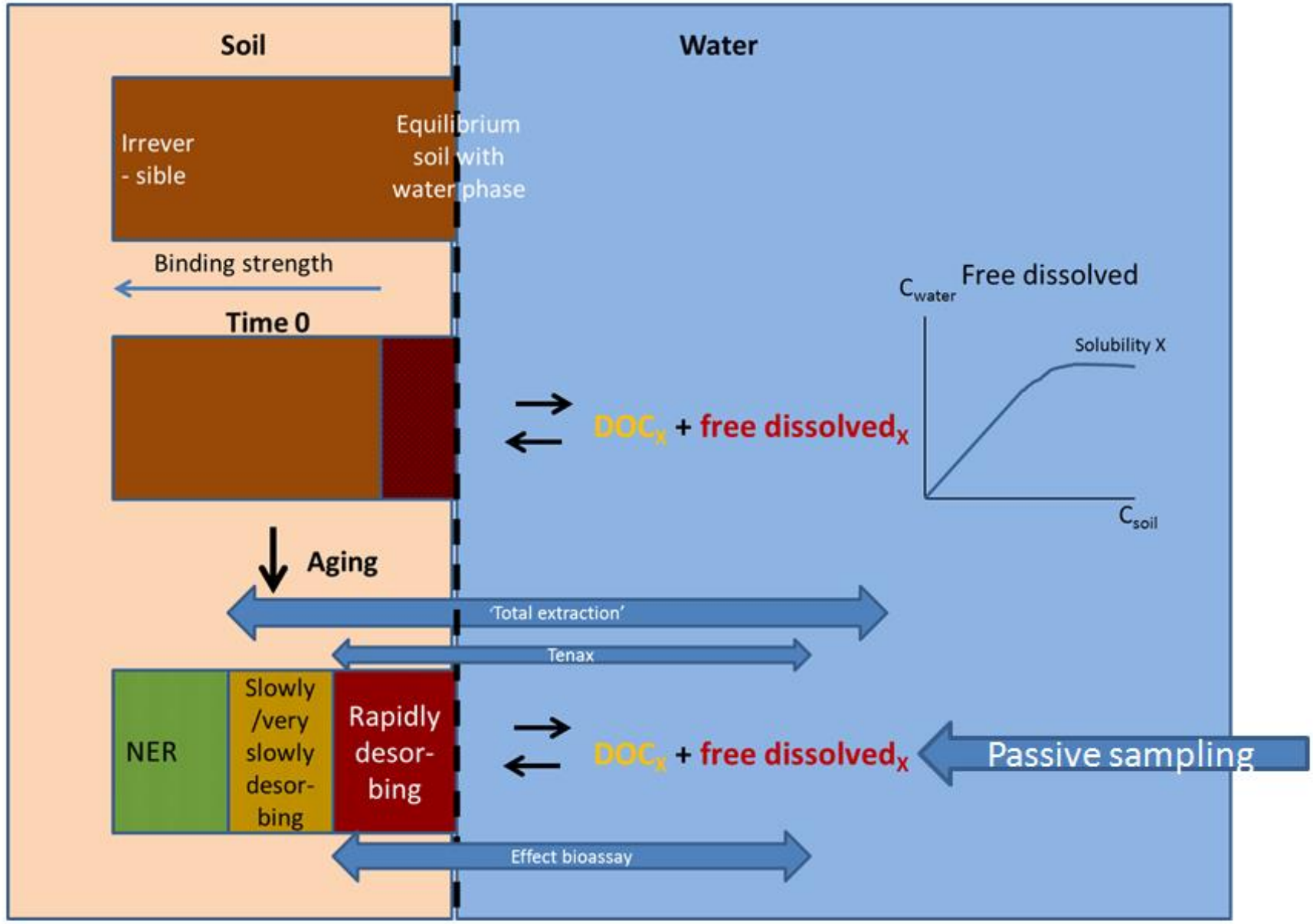
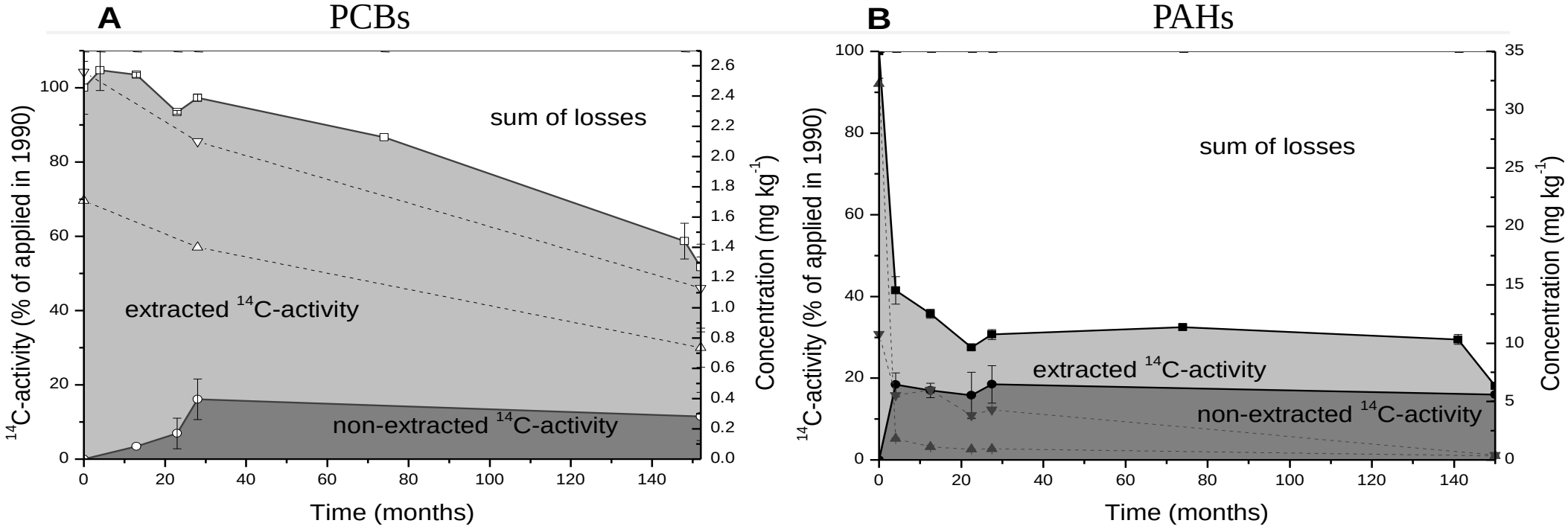
Fate and behaviour of organic contaminants in soil



Semple et al., 2003


Soil
Water
Irrever
- sible
Equilibrium
soil with
water phase
Binding strength
Time 0
Aging
C_{water} Free dissolved
Solubility X
C_{soil}
DOC_X + free dissolved$_X$
'Total extraction'
Tenax
NER
Slowly
/very
slowly
desor-
bing
Rapidly
desor-
bing
DOC_X + free dissolved$_X$
Passive sampling
Effect bioassay

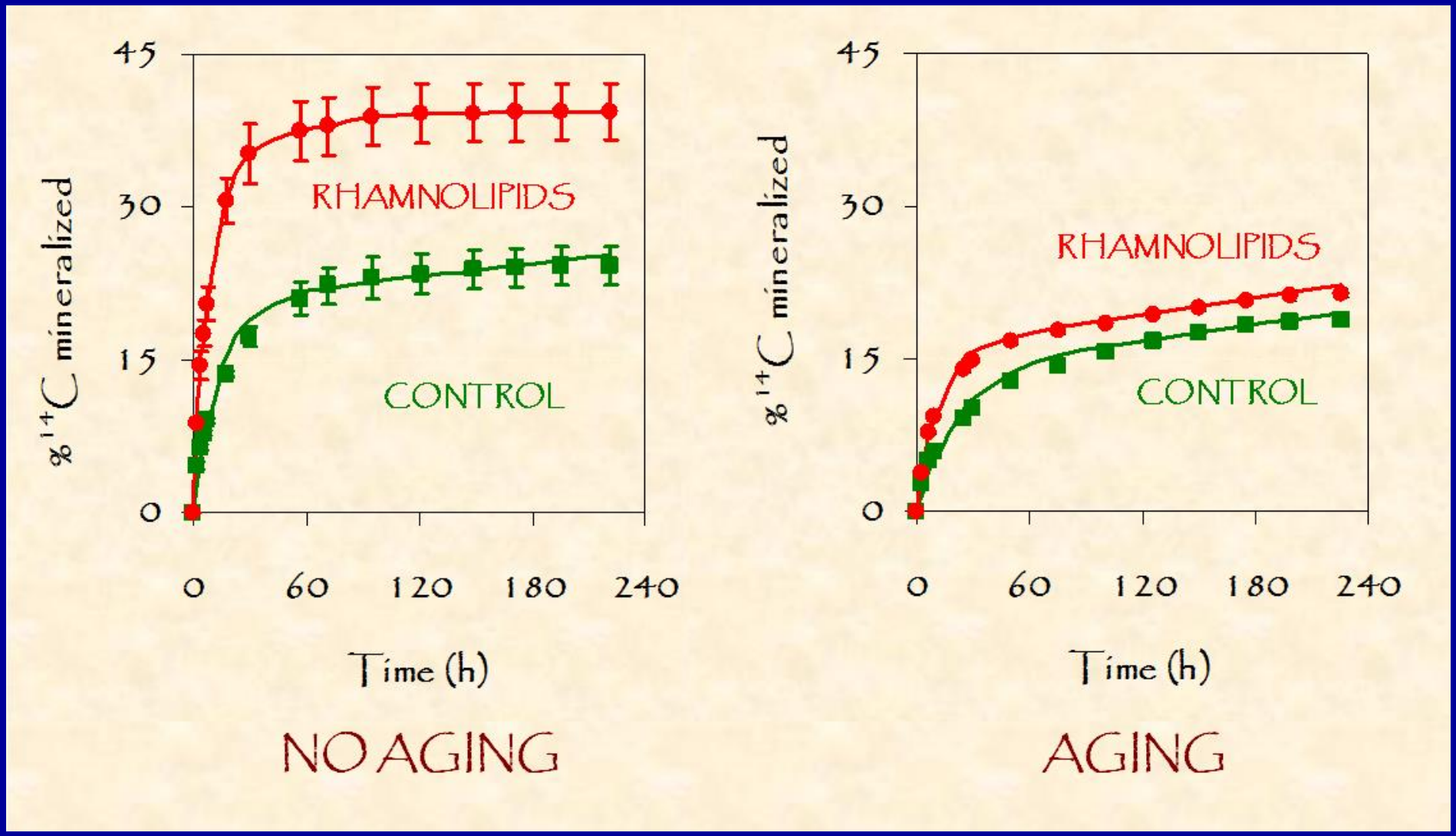
Long-term fate of PCBs and PAHs in agricultural soil



Temporal changes in (A) PCB and (B) PAH concentrations in surface soils (0-30 cm) in outdoor lysimeter studies, over ca. 13 years.
Plots show decreases in extractable ^{12}C (parent) compounds (Plot A: Δ = PCB 28, ∇ = PCB 52; Plot B: ▲ = Flu, ▼ = B*a*P).
Changes in the total fractions extractable (□ and ■; plots A and B, respectively), non-extractable (○ and ● ; plots A and B, respectively) or 'lost' (100% - sum(extractable + non-extractable)) over time.

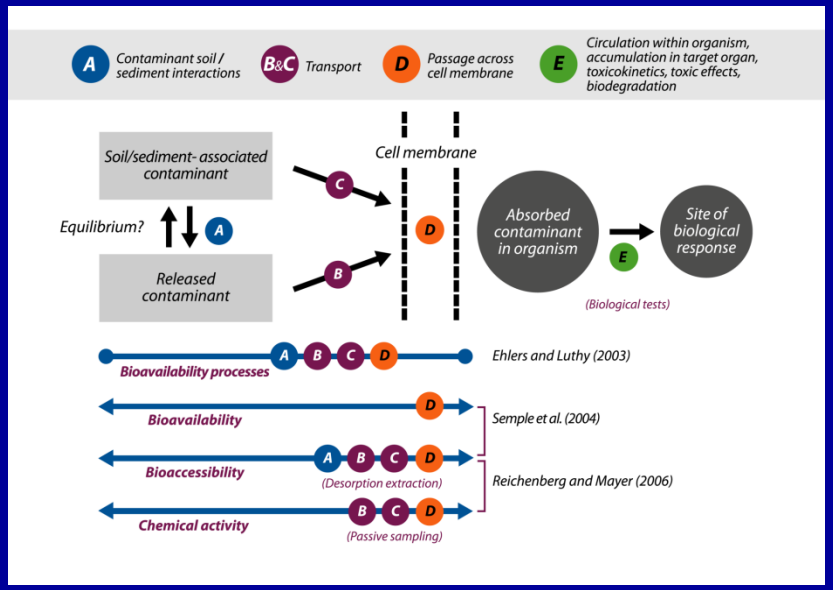
Doick et al., 2005. Environ. Sci. Technol. 39, 3663-3670

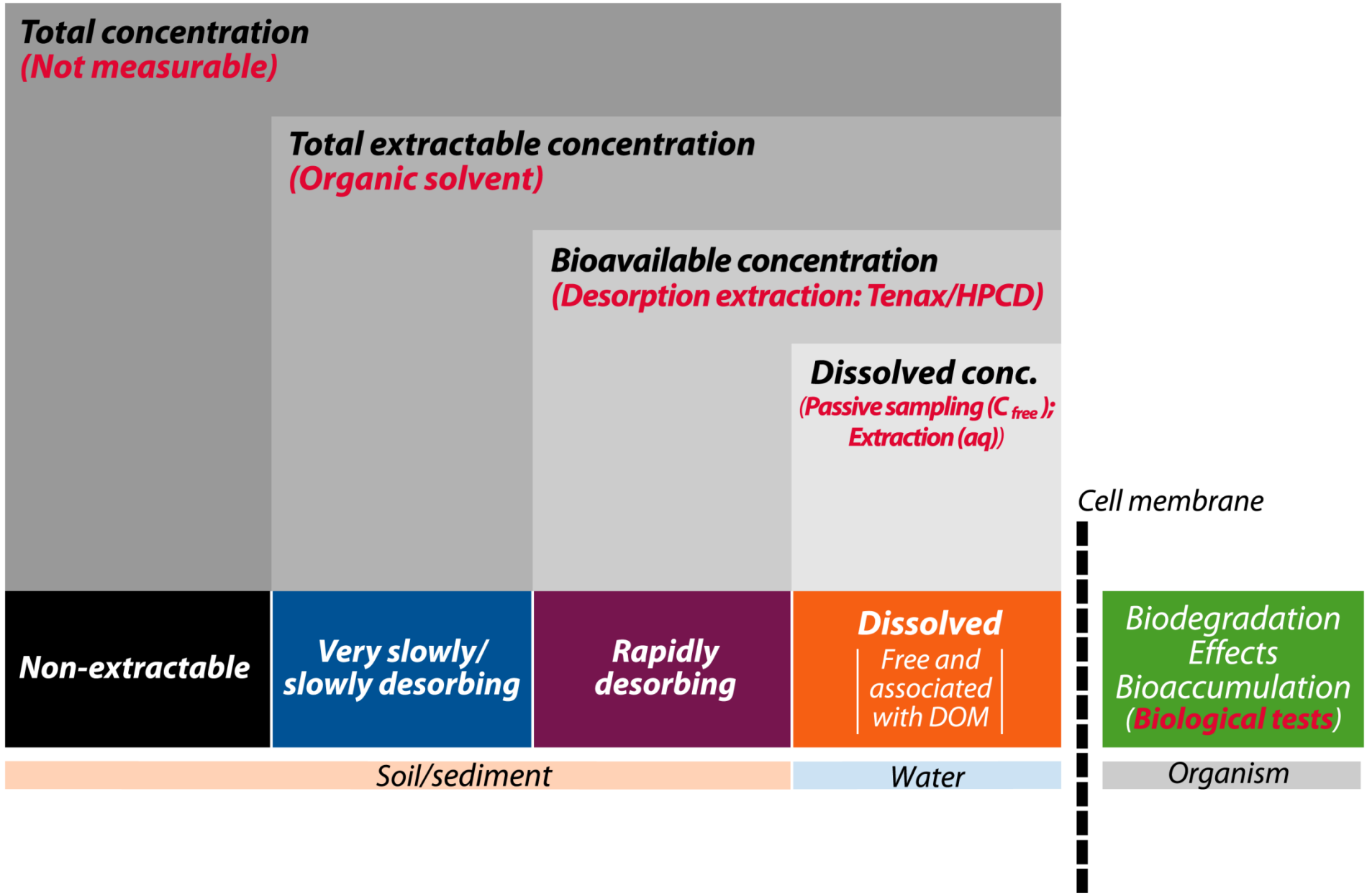
Microbial biosurfactants influence on bioavailability of sorbed pyrene: role of desorption kinetics



E. Congiu & J.J. Ortega-Calvo, *Environ. Sci. Technol.* , 2014, 45:3019-3026

Present: confusion

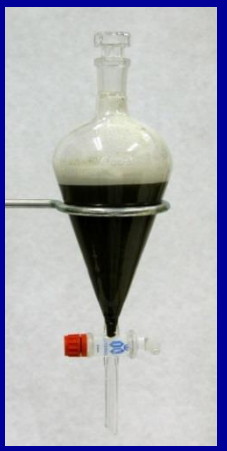


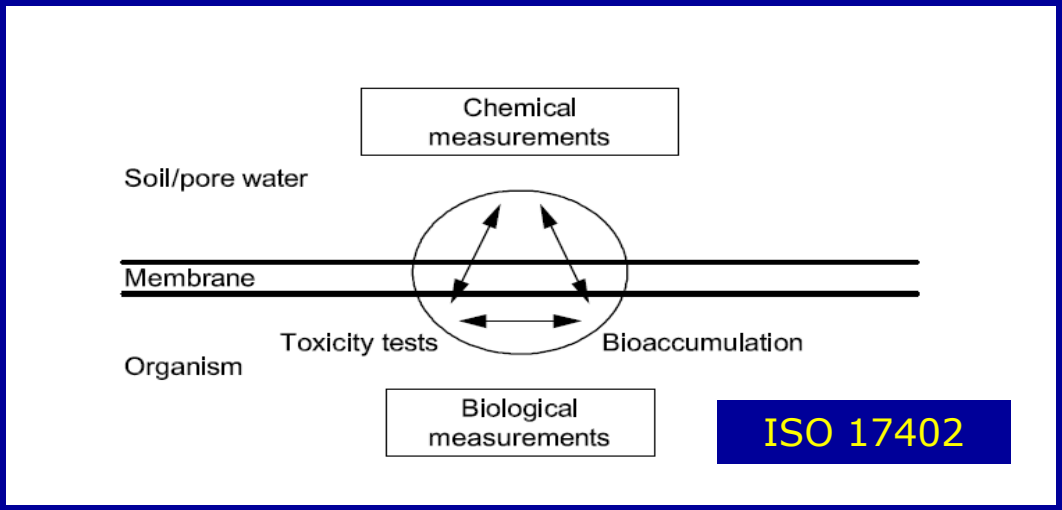


Ortega-Calvo et al. ES&T, 2015. 49, 10255-10264

Measurement of bioavailability

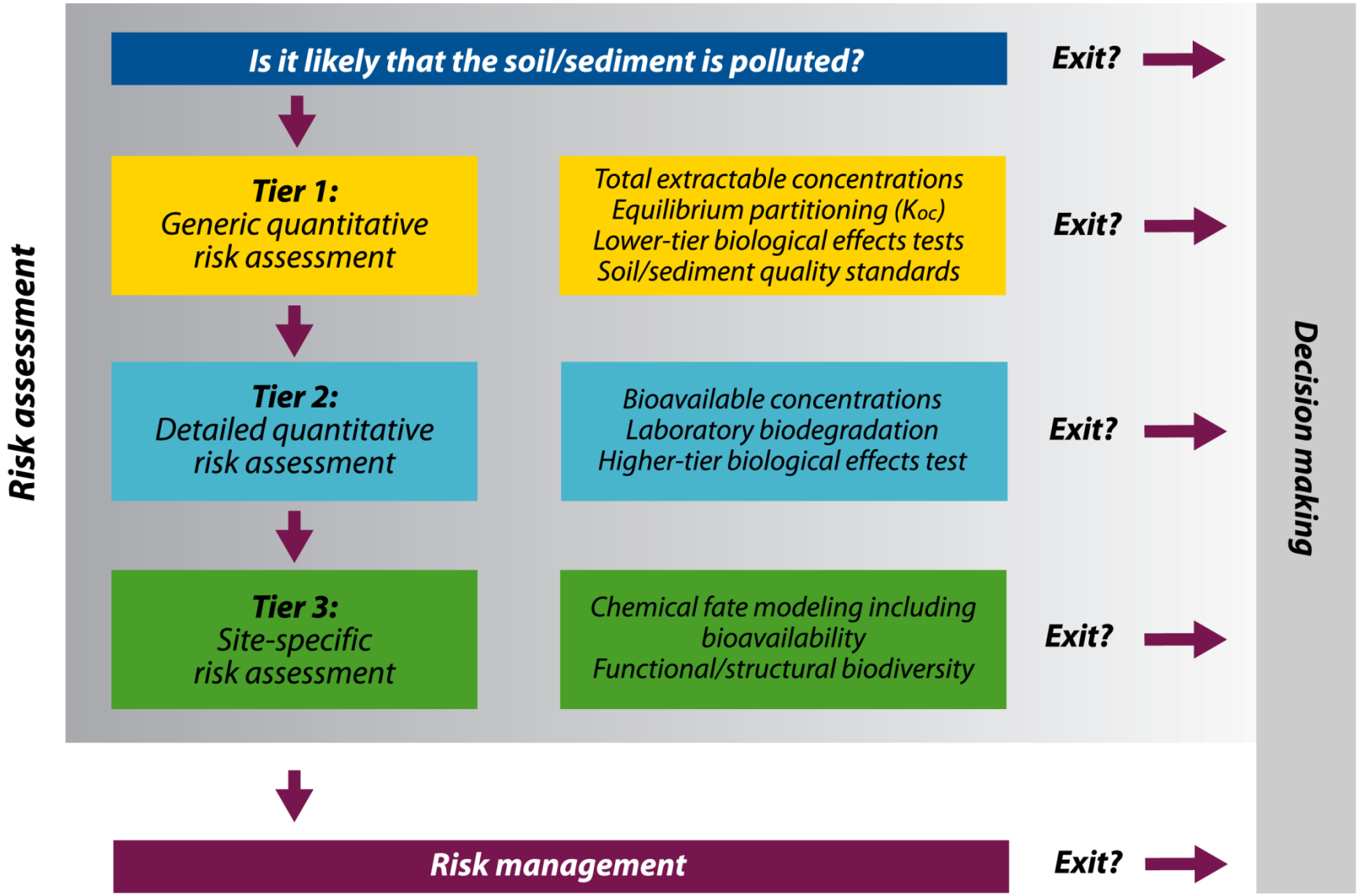
- Based on desorption of chemical using an infinite sink. Cyclodextrin/Tenax (ISO/DIS 16751)
- (Freely) dissolved in the water phase. Passive sampling.





- Focussed on pathways causing risks
- Many ISO and OECD methods are available

Tiered Risk Assessment-Management Framework



Ortega-Calvo et al. ES&T, 2015. 49, 10255-1026

"The way forward"

- **Prospective (EU) and retrospective (National) regulations need a straight forward approach.**
- **Bioavailability has a place in second tier of retrospective assessment and following management of contaminated sites**
- **Keep it simple, limit to measurable parameters (total extractable chemical and bioavailable fraction.**
- **Hazard is not coming from NER**
- **Update assessment models with bioavailability**
- **Use validated and preferably standardized chemical and biological methods.**

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Acknowledgements

Co-authors:

- **Dr Joop Harmsen**
- **Prof John R. Parsons**
- **Prof. Kirk T. Semple**
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- Dr Georg Streck
- Dr Bram Versonnen

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Thank you for listening!