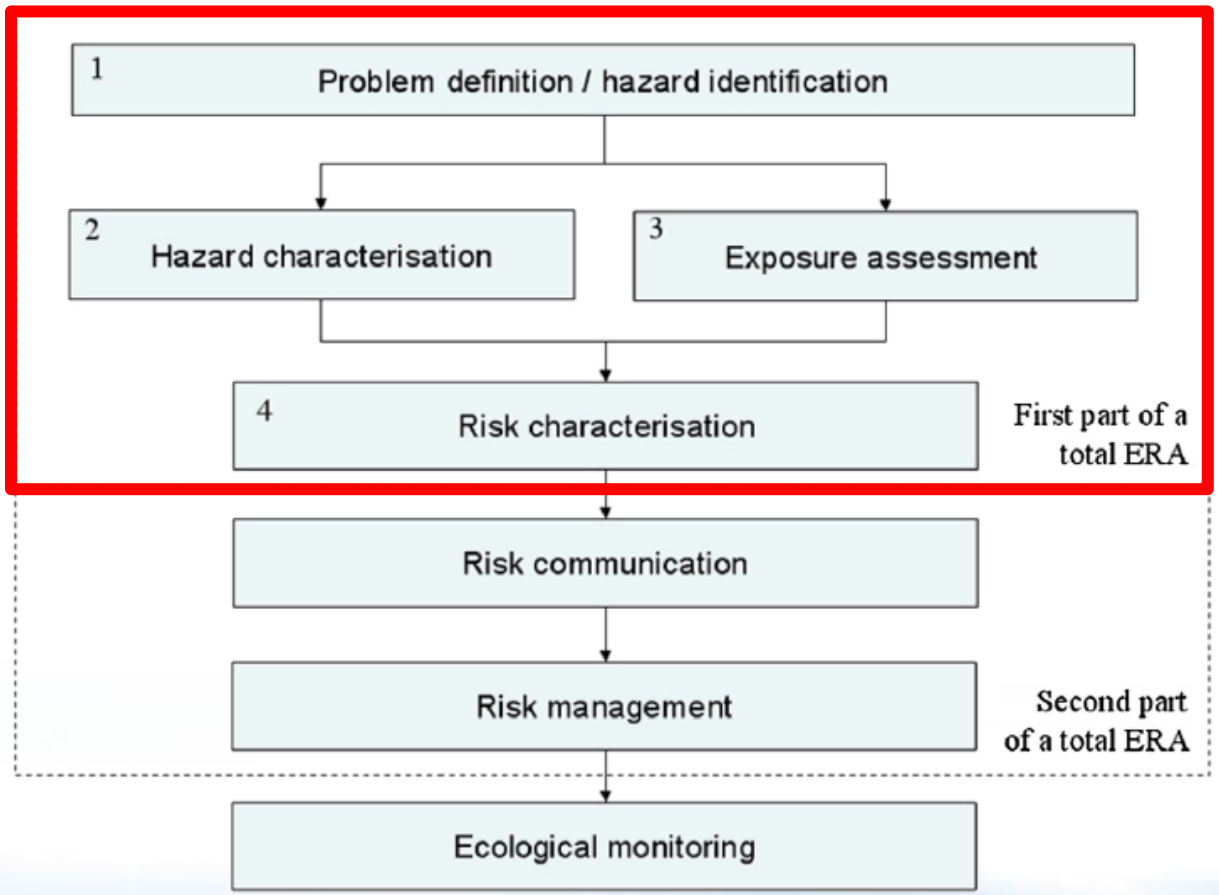
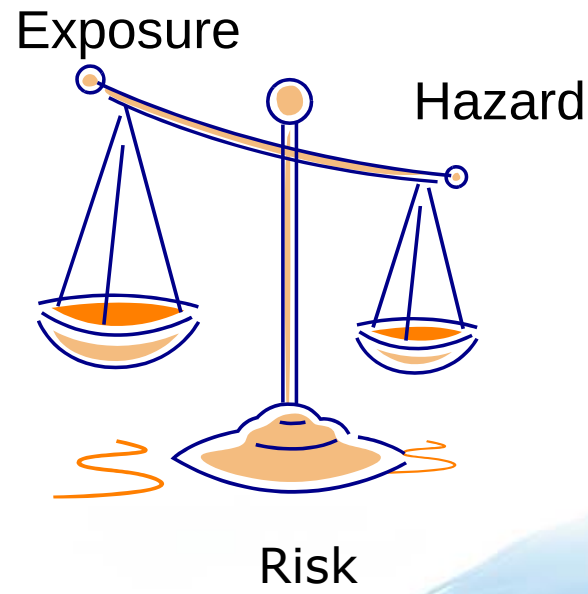
Kumulativ risikovurdering av sigevann fra eldre deponier

Knut Erik Tollefsen

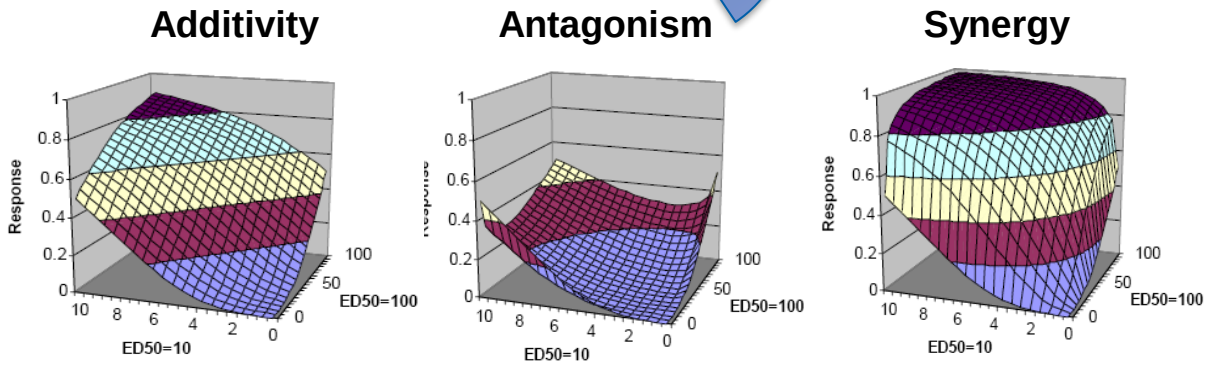
Norwegian Institute for Water Research (NIVA)
Norwegian University of Life Sciences (NMBU)
Centre for Environmental Radioactivity (CERAD)
Contact: ket@niva.no

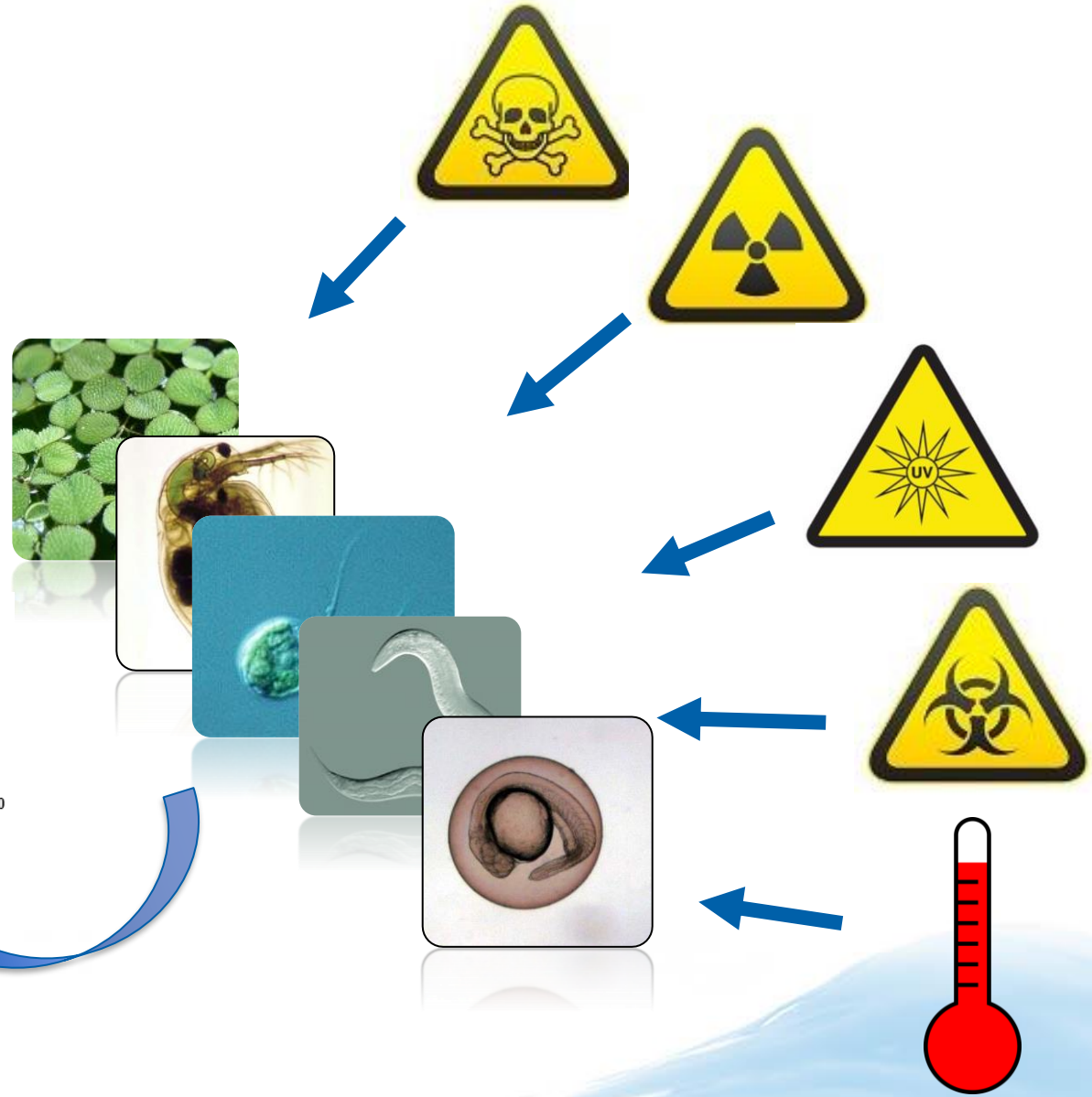
Environmental Risk Assessment





Multiple stressors



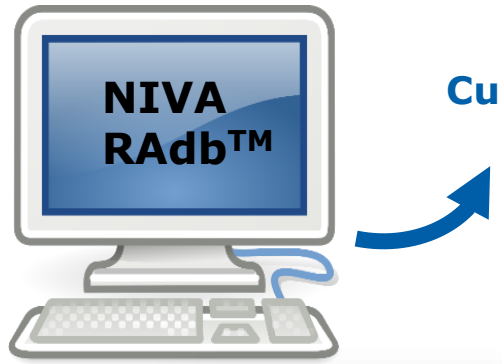


Beyer, J., Petersen, K., Song, Y., Ruus, A., Grung, M. Bakke, T., Tollefsen, K.E. (2014). Environmental risk assessment of combined effects in aquatic ecotoxicology: a discussion paper. Mar. Environ. Res. **96**: 81-91; **Salbu, B., Lind, O.C., Teien, H.C., Tollefsen, K.E. (2019).** Why is the multiple stressor concept of relevance to radioecology? Int J. Rad Biol. 11:1-10. doi: 10.1080/09553002.2019.1605463

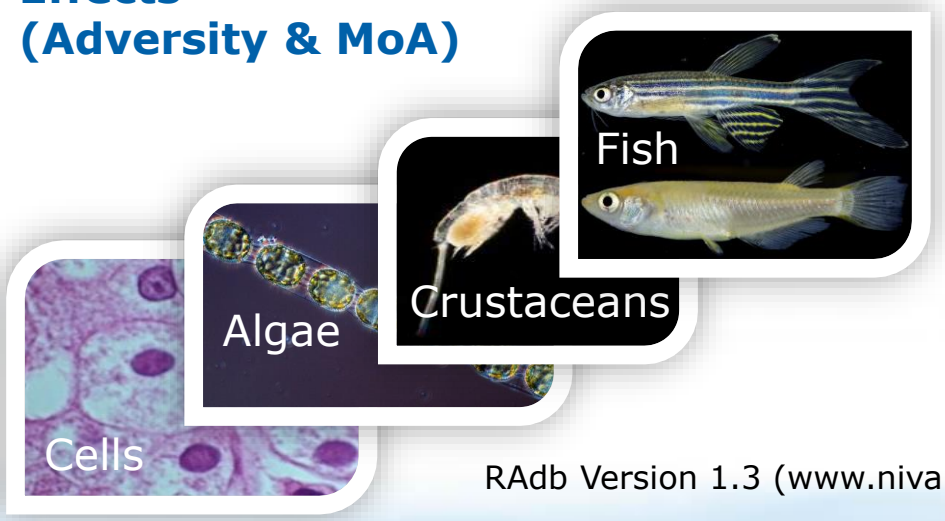
Cumulative Risk assessment (CRA)

Exposure

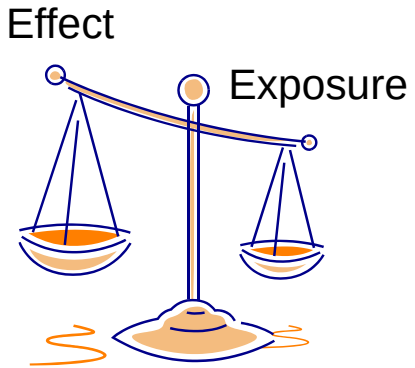
Effects (Adversity & MoA)



Cumulative Risk Assessment



RAdb Version 1.3 (www.niva.no/radb)



Mode of action (Hazard)

Exposure (single stressors)

Adverse outcome (Risk)

Multiple stressors

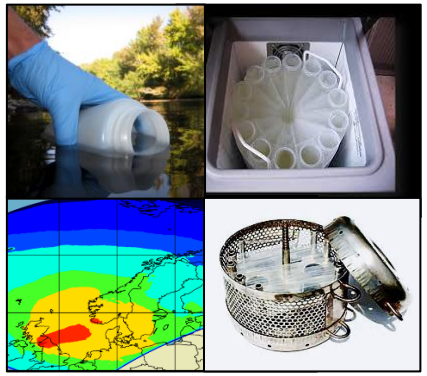
Cumulative Hazard (CHQ)

Cumulative Risk (CRQ)

Risk (RQ)**= $\sum_{n+1}^{n} EXPOSURE/EFFECT$

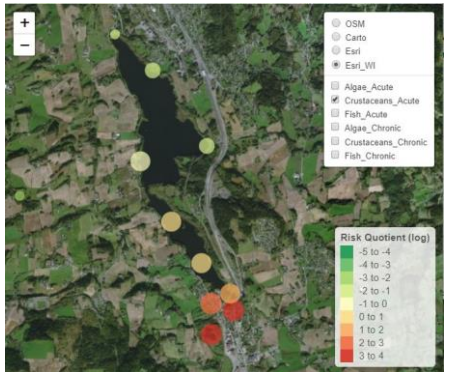
Analysis pipeline

Exposure

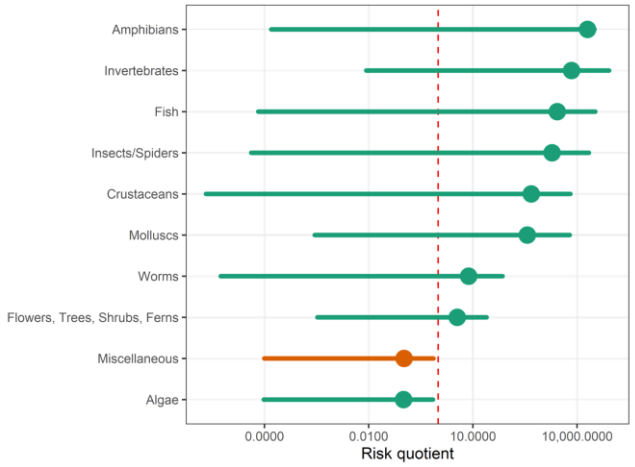


NIVA RAdb™

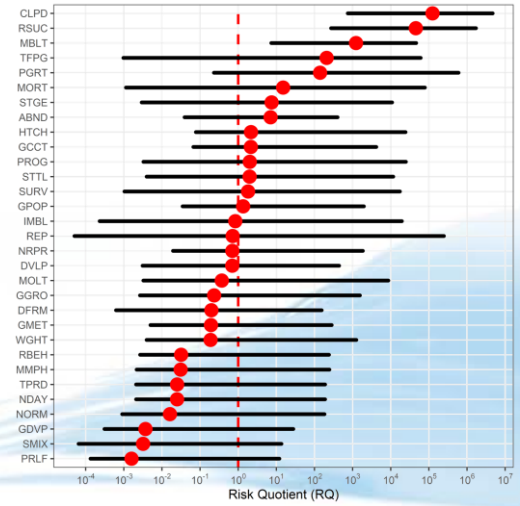
Hotspot Identification (Spatio-temporal)



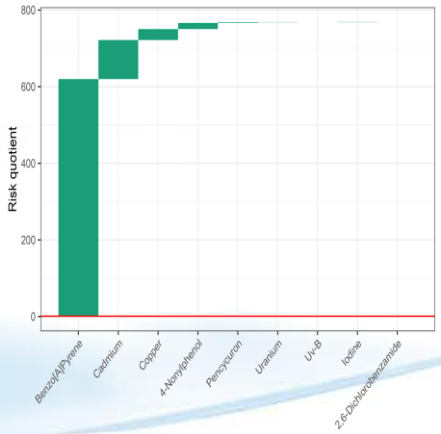
Susceptible Species Identification



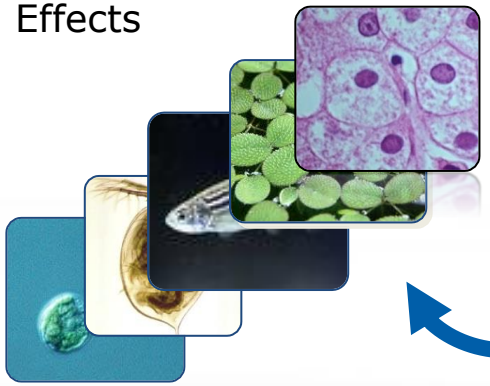
Adversity Identification



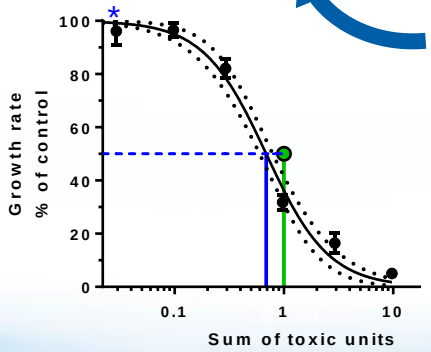
Risk Driver Identification



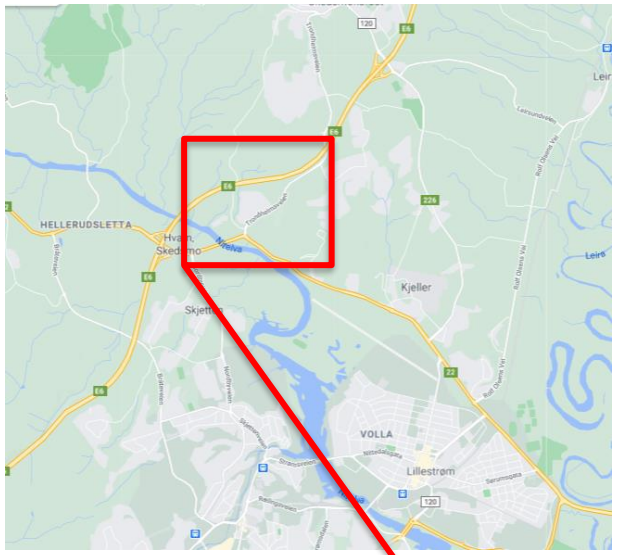
Effects

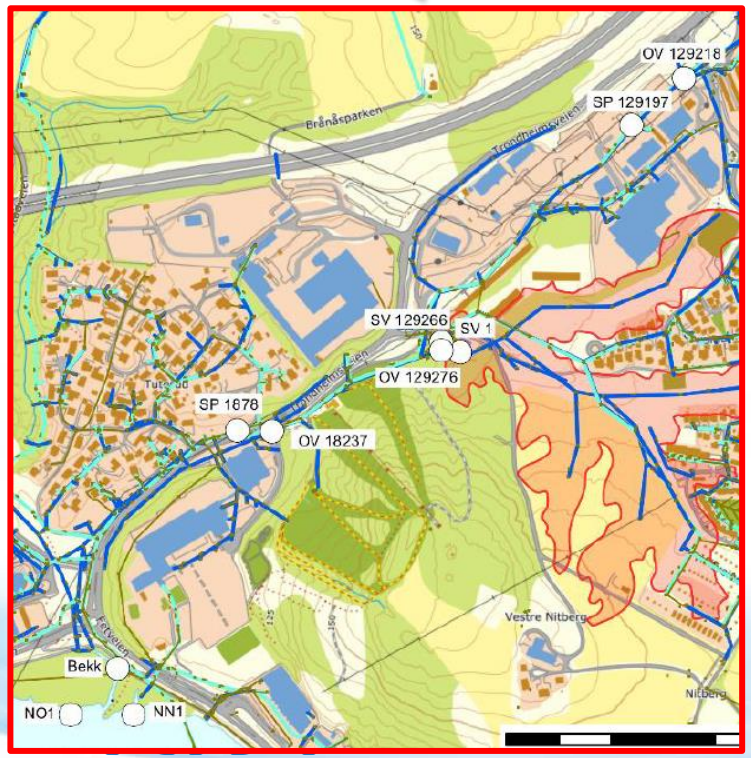


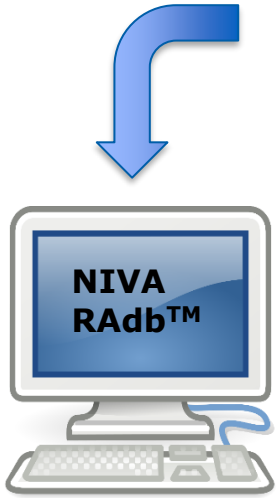
Lab evaluation



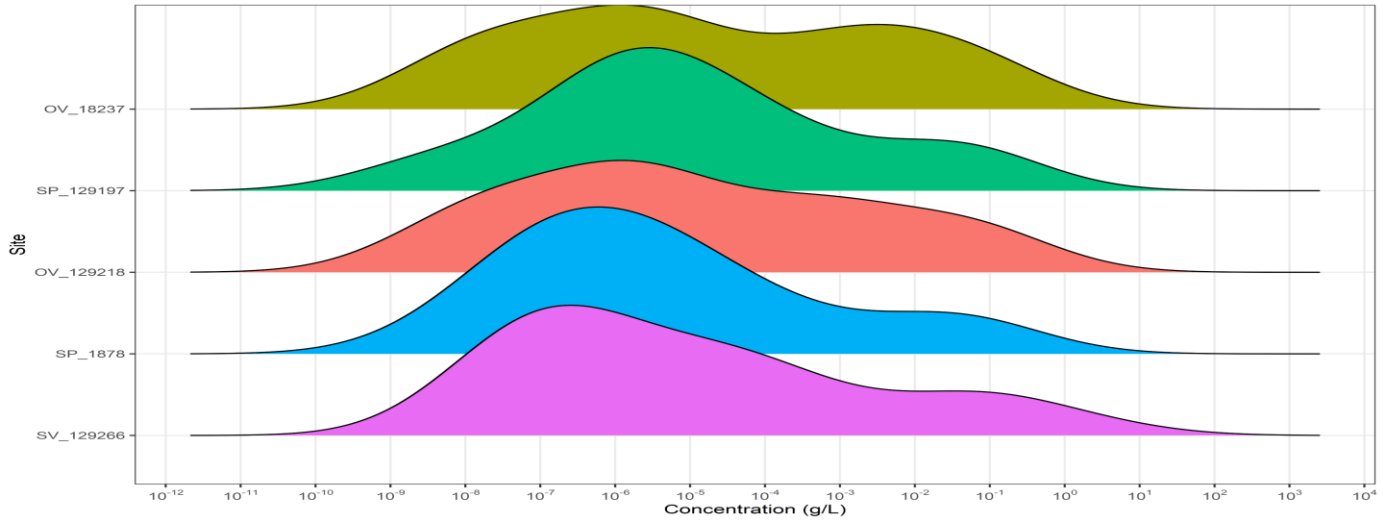
Brånåsdalen avfallsdeponi



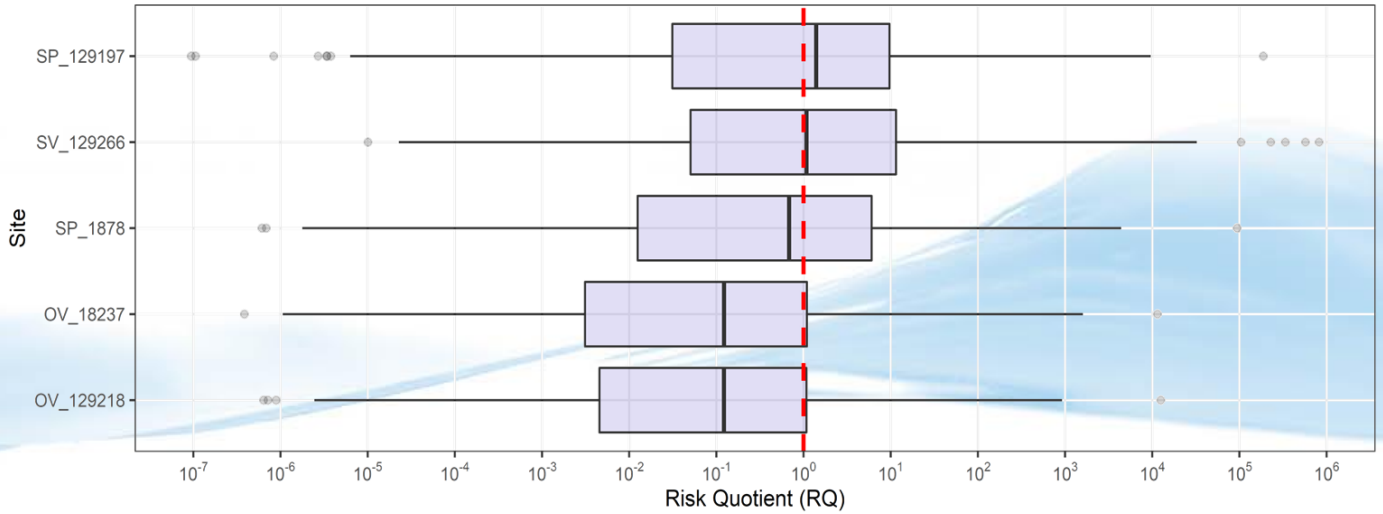




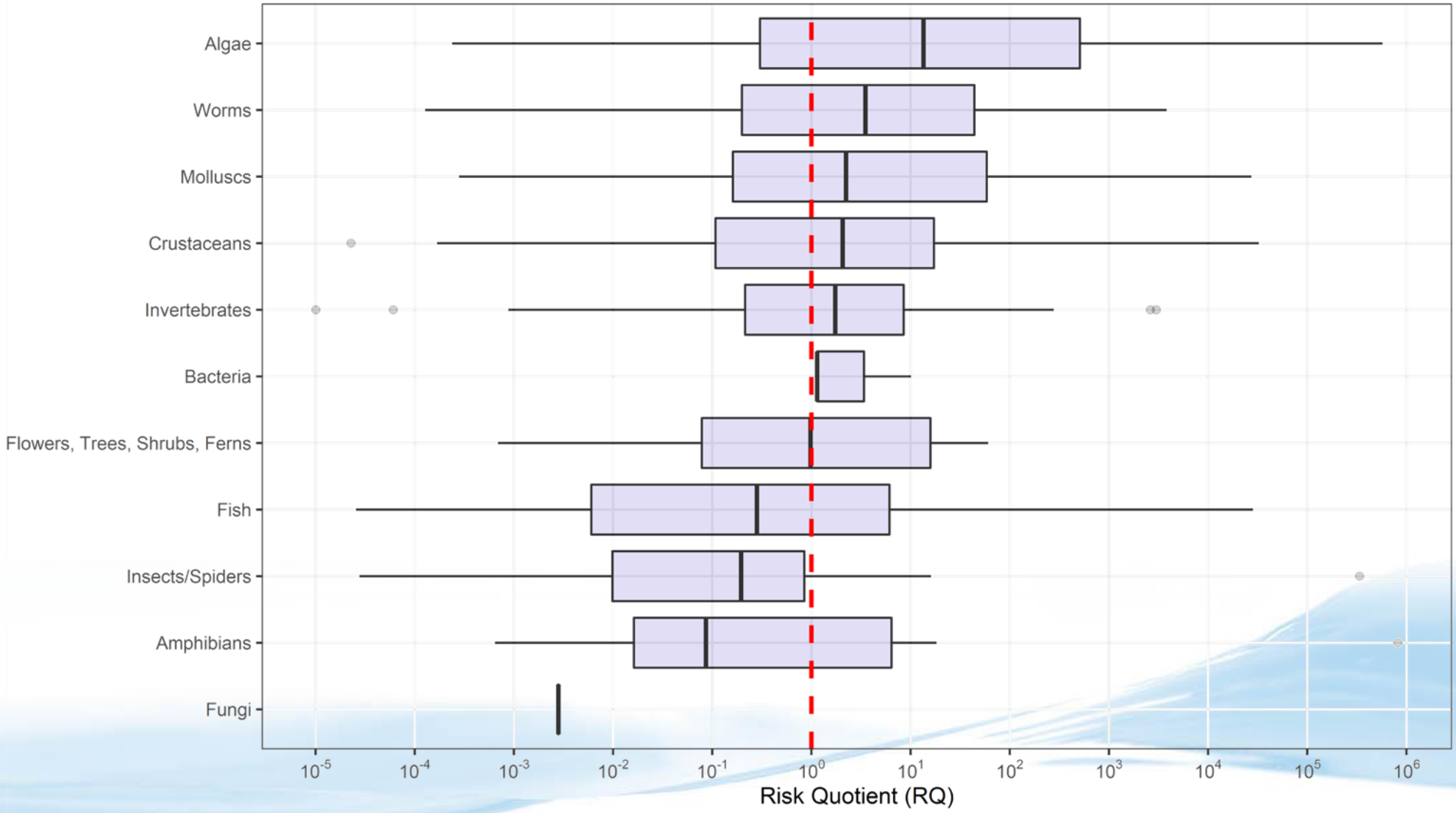
Exposure



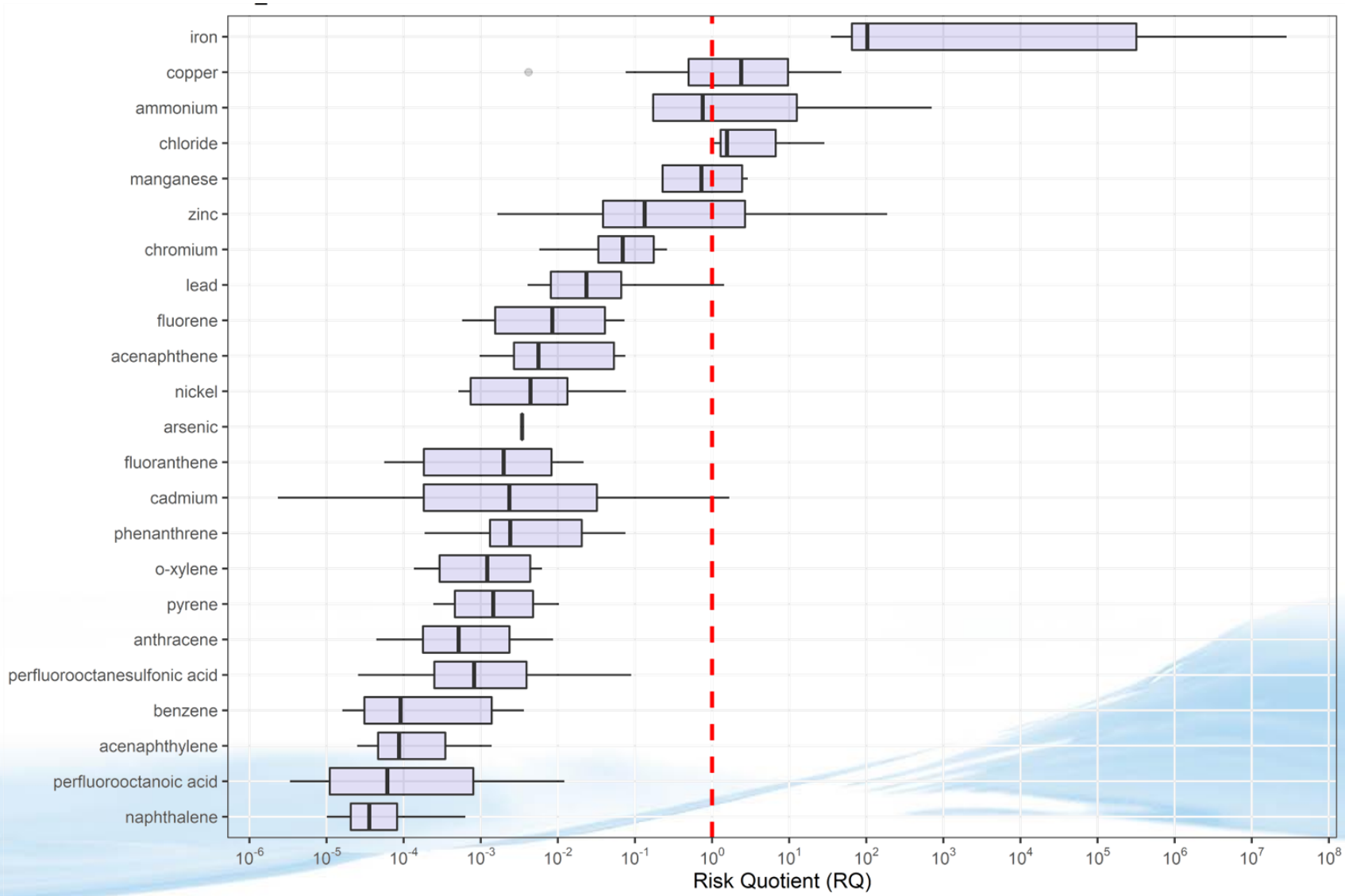
Site-specific risk (acute effects)



Susceptible species (Acute effects)



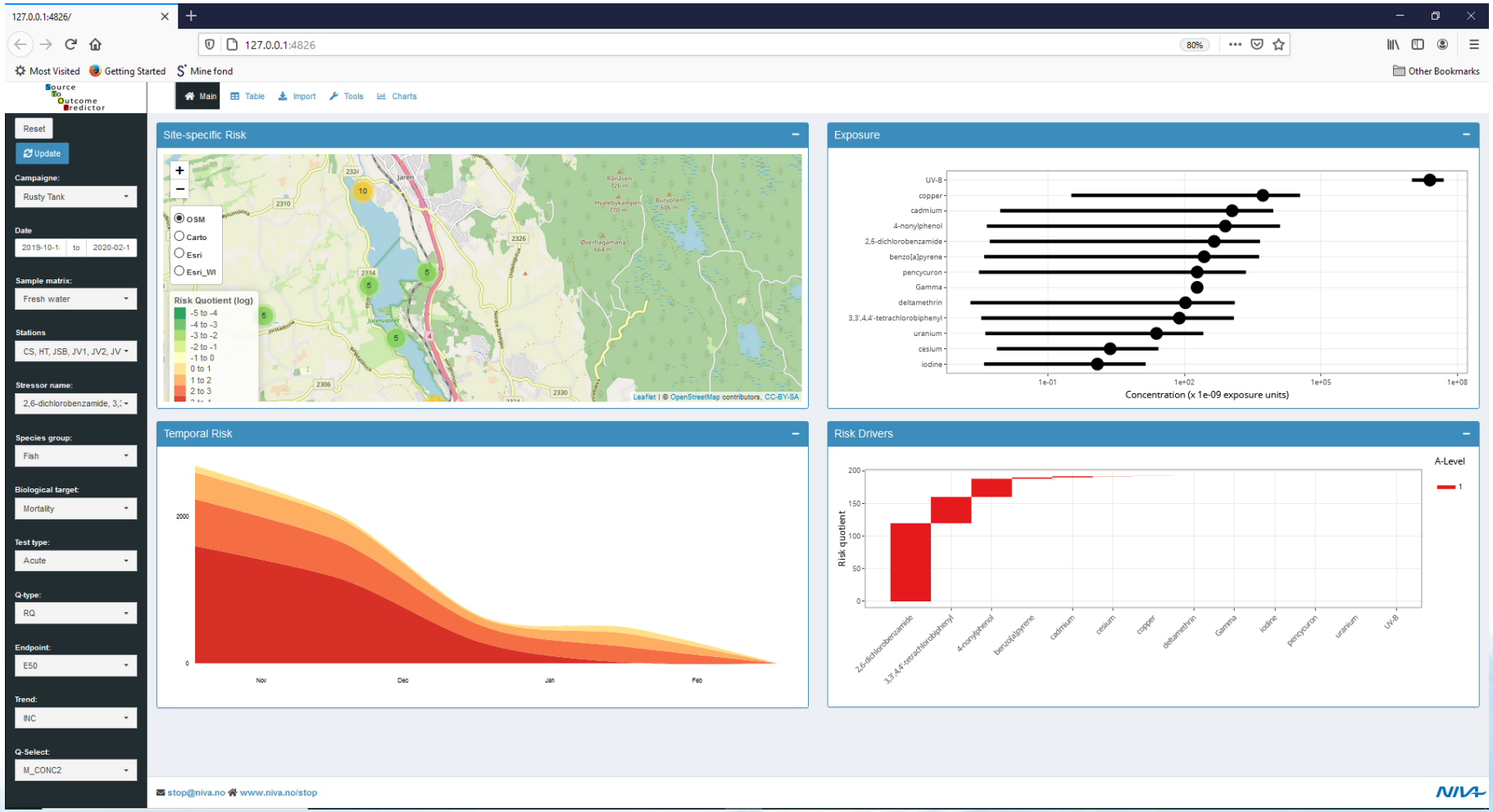
Risk drivers (Fish, Acute effects)



Facilitating end-user interactions

Source To Outcome Predictor

(www.niva.no/stop)



Graphical User Interphase

- Exposure information
- Hazard characterisation
- Cumulative Risk Assessment
- Data repository (FAIR)
- EFSA recommend. compliant*

NIVA

* Harmonisation of Cumulative Risk Assessment for humans and wildlife

So…. what are the benefits?

- Rapid and cost-effective (semi-automated)
- Holistic and integrative assessments
- Principles applicable to different matrices (water, soil, sediments, air, biota/humans)
- Standardised and transparent approaches
- Compliant with several regulatory initiatives
- Supports retrospective, prospective and mitigation-based assessments
- Expands on current approaches (e.g. sigevannsveileder)
- Automation friendly (e.g. realtime and automated sensor systems)

And…. limitations?

- CRA currently doesn’t address other combined effects than additivity
- It’s well developed for water, but other matrices are still in pipeline
- Bioavailability and speciation (metals) are potential confounding factors to predictions
- Limited effects data for certain stressor, matrix, species and toxicity effects combinations
- Verifications of predictions of real life complex mixtures are limited
- It’s currently not endorsed, nor implemented in impact/safety assessments of leachates
- NIVA RAdb and STOP are research tools, but are increasingly used more pragmatically
- ……

Acknowledgements

Jens Vedal
Sissel Brit Ranneklev
Samantha Martins
Sondre Meland
Viviane Girardin

Helen Kristine French

Karoline Sivertsen

Esther Bloem
Trond Mæhlum

More information?
www.niva.no/nctp
www.niva.no/radb
www.niva.no/stop
www.niva.no/mixrisk
www.niva.no/cerad
www.nmbu.no/tjenester/sentre/earthresque

Contact
Knut Erik Tollefsen, ket@niva.no

Funding

Financial support from Research Council of Norway (SFI earthresQue, 268294 MIXRISK, SFF 223268 CERAD), NIVAs Computational Toxicology Program (NCTP).