How to improve risk management to reduce chemical pressure on biodiversity in Europe

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Introduction

Mounting evidence indicates that chemical pollution is a major driver of biodiversity loss (e.g. Sigmund et al. 2023; Mueller et al. 2023). The harmful effects of chemicals on biodiversity are characterised by complexity, uncertainties and unknowns. Additionally, chemicals pose interconnected threats that can cascade across various systems and sectors, making chemical pollution a systemic risk (van der Vegt et al. 2022). This has led to scientific discussions about methodological challenges and problems, particularly in regulatory environmental risk assessment (ERA) practices (Axelman et al. 2024; Sigmund et al. 2023). But the ERA is only one phase within the decision-making process of risk management (RM). Given that chemical risks to biodiversity can never be fully assessed, it is crucial to recognise and quantify uncertainties of chemical impacts and integrate these into the decision-making process. Therefore, in the TerraChem project, we conceptualise a comparative analysis of RM structures among different European substance regulations (plant protection products (PPPs), biocides, veterinary medicinal products (VMPs), human medicinal products (HMPs), REACH, and CLP) to identify barriers and opportunities for better integrating biodiversity into RM decision-making. Here, **we present our methodological and conceptual approaches** and initial project results to better address biodiversity within RM processes.

Methodological approach

Based on the conceptual framework and initial results we will conduct three in-depth analyses of relevant stages or practices within the various regulatory frameworks (PPPs, biocides, VMPs, HMPs, REACH, and CLP) to find ways to better integrate biodiversity protection into RM processes.

Dealing with uncertainties and the Precautionary Principle – Necessities and opportunities to assess and manage biodiversity risks

1. Focus group with risk assessors of different regulatory regimes
2. Comparative case studies approach

Explore barriers and opportunities of new integrative monitoring strategies

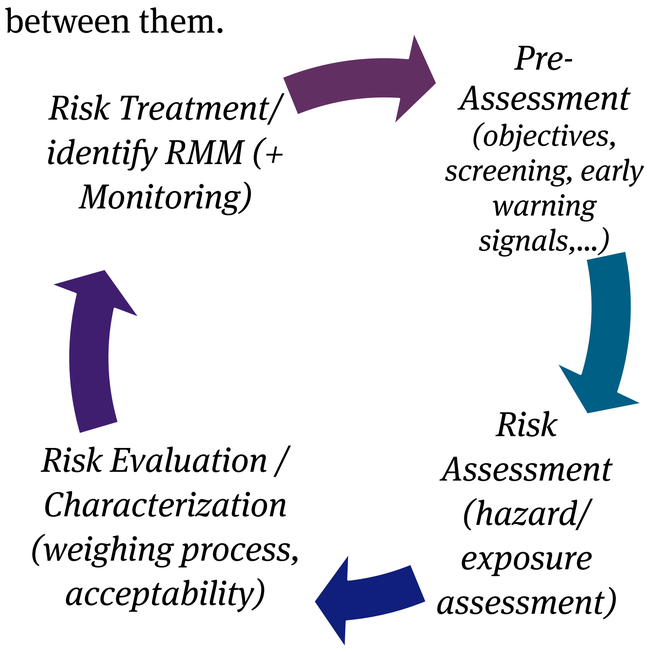
1. Focus group/Theory of Change
2. Expert interviews

Integration of biodiversity in weighing procedures

1. Document analysis
2. Focus group/ Expert interviews

Conceptual framework

We describe **risk management** as a process consisting of distinct phases that can be analysed individually, as well as the interconnections between them.



Based on Risk Governance concept, see Renn and Sellke 2014

- Different **types of risks** require distinct **strategies** and **principles** for effective RM (e.g. Klinke et al. 2006)
- **Uncertain and systemic risks** encompass both known unknowns and unknown unknowns → application of the **precautionary principle (PP)** and incorporation **of (new) evidence**
- **Principles connected to PP:** reversibility, adaptability, proportionality, weighing procedure between action and non-action

Initial results

Based on scientific literature, informal exchanges with stakeholders and a regulators workshop, we identified intervention points that informed the in-depth analyses.

- The current risk-informed strategy of RM does not adequately address uncertain and systemic risks.
- The hazard-based approach, which considers persistence alone as sufficient for concern (Cousins et al. 2019), is prevalent.
- There are obstacles to justifying risk management measures (RMM) based on evidence-based suspicion regarding biodiversity risks.
  Solution options:
  - Stronger interpretation of PP and adaptability in RM are necessary to address uncertainties.
  - Integration of evidence and uncertainties regarding biodiversity risks into (new) weighing procedures
  - Overcome barriers regarding availability/usability/acceptability of evidence.
- Lack of monitoring data (link between exposure and effect in the field; effectiveness of RMM) → lack of feedback loops
  - Siloed thinking in ecology and ecotoxicology research → Need to overcome disciplinary barriers.
  - Improve identification of early warning signals for terrestrial biodiversity risks.

Literature

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