Modelling aquatic exposure and effects on catchment scale

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EL-LA-AQUA

BACKGROUND

Aquatic risk assessment of plant protection products within the European regulatory framework follows a tiered approach, where lower tiers apply conservative edge-of-field scenarios, while higher tiers allow refinement through increased ecological and spatial realism where scientifically justified. Landscape-scale modelling provides a means to explore this additional realism in higher-tier assessments.

Although a wide range of tools and models for PPP exposure and effects is available, their combined and consistent application across spatial scales has not yet been corroborated for regulatory risk assessment. In parallel, interest is increasing in approaches that support catchment-scale risk management and stewardship in line with wider EU water protection objectives.

METHODS

Model applications were implemented within the xLandscape framework [1], integrating established regulatory exposure models for spray drift, runoff, drainage, and aquatic fate with mechanistic effect models. Three illustrative case studies were defined for an agricultural mesoscale catchment (Funne catchment, Germany).

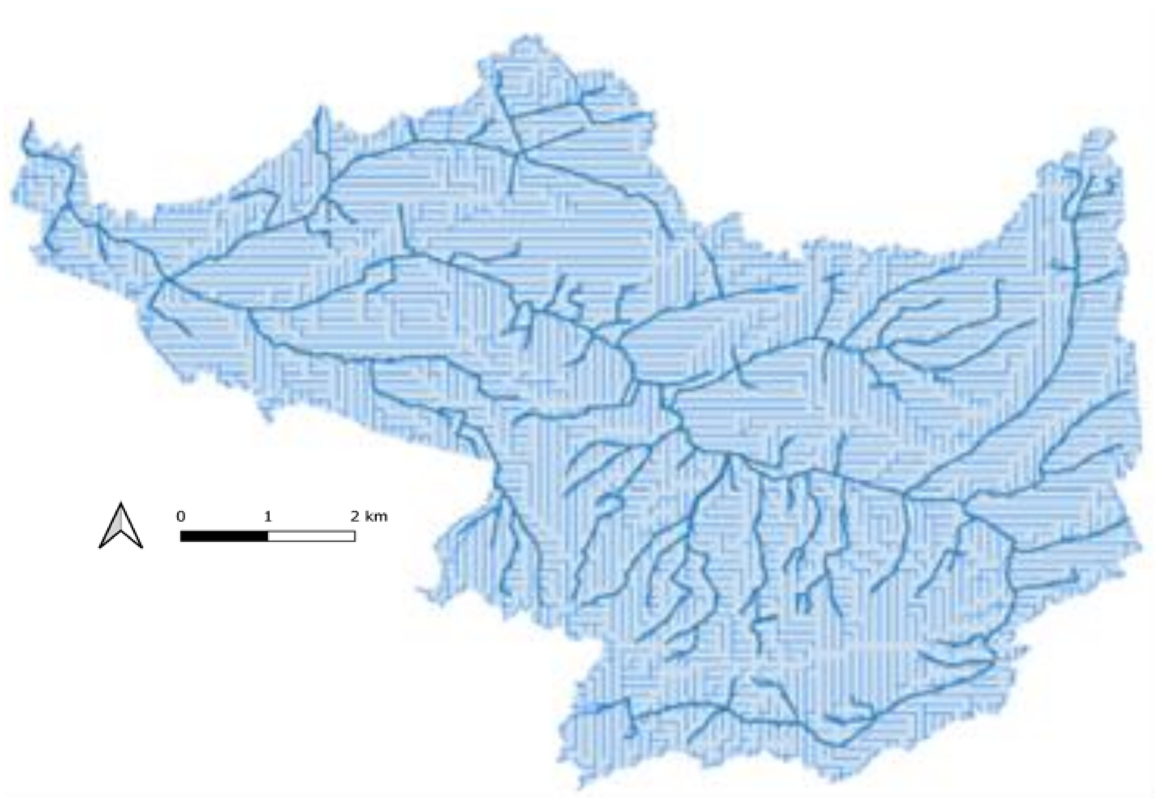
Ongoing work within ELINK-2 aims to provide a proof-of-concept for technical implementation and to explorer key challenges for future work, including mixture toxicity, data availability, validation strategies, transparent uncertainty communication, and pragmatic pathways for regulatory consideration.

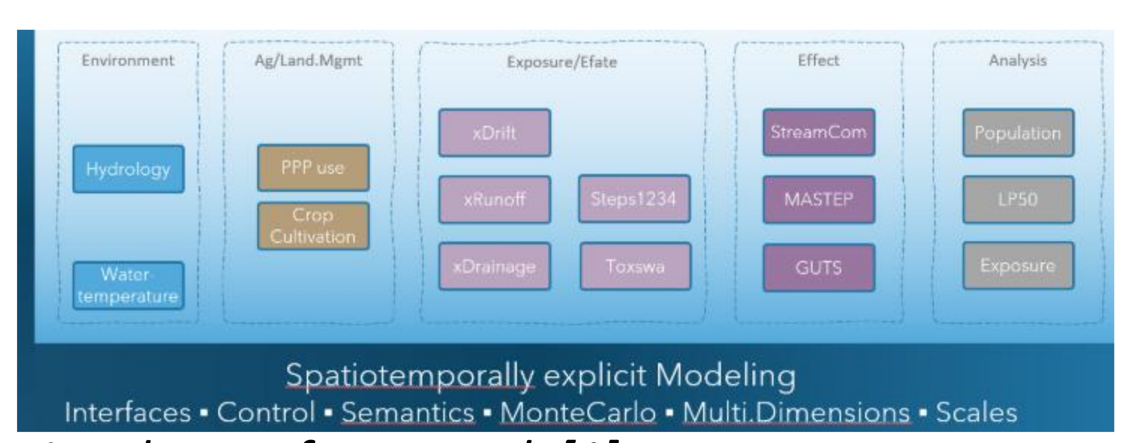
OBJECTIVES

This poster outlines the current status, key discussion topics, and planned work of the ELINK-2 Aquatic Landscape Working Group, based on exchanges during the inaugural workshop held in March 2026. The group aims to publish its first results in mid-2027.

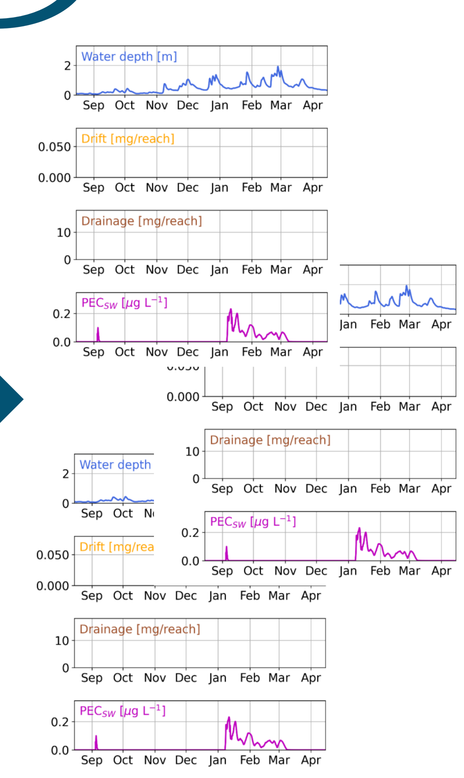
The workshop explored the applicability, transparency, and regulatory relevance of landscape-scale aquatic risk assessment using linked exposure and effect models, building on established regulatory concepts and tiered assessment principles.

- ❑ **Adress key aspects such as**
  - ❑Spatially explicit vs implicit
  - ❑Integration and Feedback
  - ❑Extrapolation / Aggregation
  - ❑Uncertainty
  - ❑Tools and data gaps



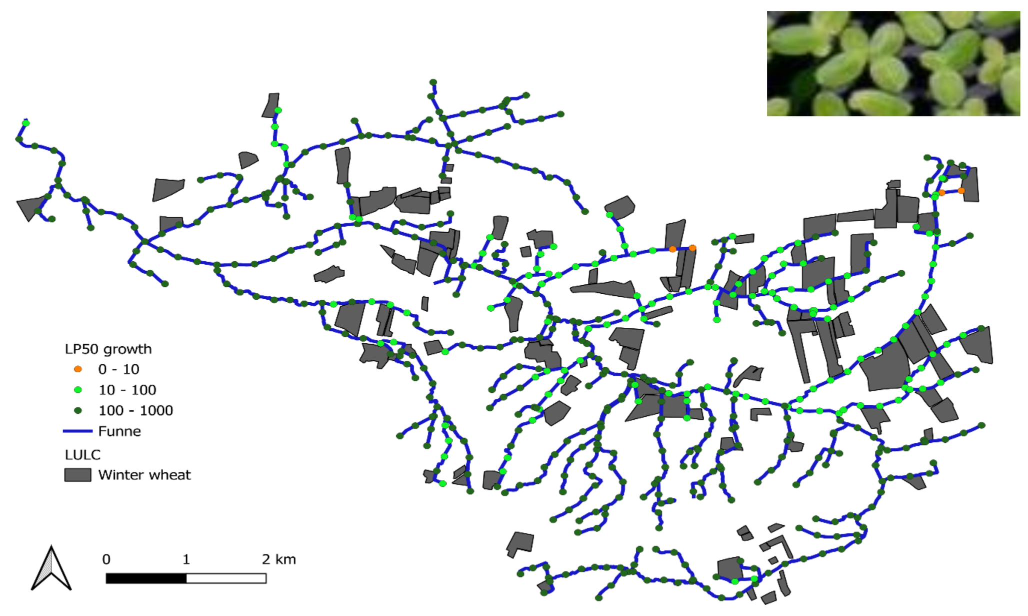


xLandscape framework [1].



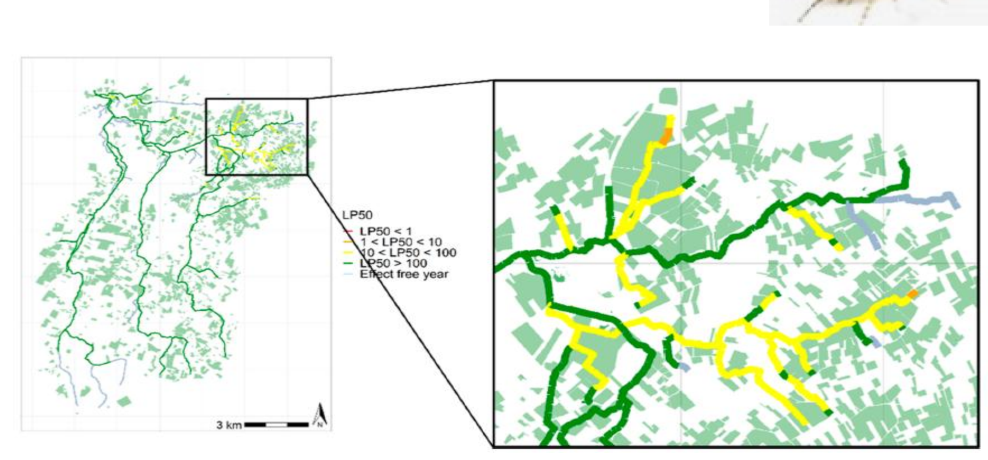
CASE STUDIES

(1) Macrophytes | *Lemna sp.* | Herbicide



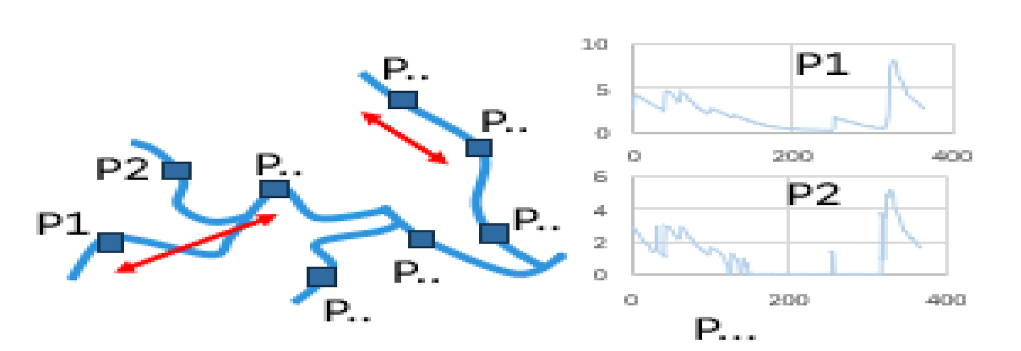
Macrophytes exposed to a herbicide using a toxicokinetic–toxicodynamic model for Lemna sp. [2].

(2) Invertebrates | *Asellus Aqu.* | Insecticide



Aquatic invertebrates exposed to an insecticide using an individual-based model for Asellus aquaticus [3].

(3) Fish | *Stickleback* | Fungicide



Fish exposed to a fungicide using an individual-based model incorporating habitat structure and mobility [4].

Exposure estimates were derived for one or more pathways using FOCUS models adapted to landscape scale (Rautmann drift curves, MACRO, PRZM) and newly developed tools (e.g., mechanistic drift modelling with DAD-Drift) integrated with xLandscape. Concentrations in water bodies and sediment were calculated using a simplified fate model based on STEPS1234 (one water layer, two sediment layer; hourly timestep).

REFERENCES

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