EGU25-5975



Modelling floods, droughts and humans: A systematic review of hydrological hazard management in agent-based models

Introduction

Hydrological hazard management is complex due to the dynamics between humans and water. One aspect of complexity is that hazard management is conducted by individuals and non-individuals (e.g., municipalities) that may not act rationally.

Agent-based models have emerged as tools to explore human-hazard dynamics, as they can simulate micro-processes within society.

Research Gap: No previous reviews have synthesised the behaviour of non-individual agents and their hydrological hazard management.



Methods

Used ROSES protocol to ensure a transparent and replicable systematic review¹.







Fredrik Schück^{1, 2}, Berit Arheimer¹, Maurizio Mazzoleni³, Luigia Brandimarte²

1: SMHI, the Swedish Meteorological and Hydrological Institute, Sweden, 2: KTH Royal Institute of Technology, Sweden, 3: Vrije Universiteit Amsterdam, Netherlands



Presenter contact Fredrik Schück fredrik.schuck@smhi.se linkedin.com/in/fredrik-schück

References

1: Haddaway, et al. (2018). ROSES RepOrting standards for Systematic Evidence Syntheses: Pro forma, flowdiagram and descriptive summary of the plan and conduct of environmental systematic reviews and systematic maps. *Environmental Evidence*

<u>Acknowledgments</u>

Rättvist Vatten is a collaborative project involving SMHI, the Stockholm Environmental Institute, and Linköping University. Funded by FORMAS.









What is an agent-based model?

Agent-based models are simulations containing autonomous decision-makers, i.e. agents. Agents can represent humans that can interact with each other and the environment based on decision rules.

The agent-based model can be coupled with a hydrological hazard model to study how society and humans respond to risk.

A typical model includes household agents that adapt to floods along a river reach. However, agents could also represent a non-individual (e.g. NGO).

Opportunities moving forward

Agent-based modelling is a commendable effort to incorporate human-nature dynamics into hydrology. Yet, the capabilities of agent-based models are underutilised.

Most models follow certain practices. Thus, we can learn from the few models that break the pattern.

Stakeholders are seldom involved, but some studies incorporate them in novel ways. Stakeholders' interaction could lead to increased research uptake and system knowledge among hydrologists.

Agent-based models are used in several research fields (e.g. sociology). We should view this as an opportunity to work interdisciplinarily with researchers to adopt a systemic perspective on human-nature systems.

