

Integrating evidence-based dynamic flood precautionary behaviour in an agent-based modelling approach

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WHAT ARE AGENT-BASED MODELS?

- Agent-based models (ABM) simulate **complex dynamic systems**.
- ABM are built by **agents** that are represented by **individual behaviour**, **interacting** with each other and their environment. Those **combined** simulated dynamic actions and reactions in an ABM initiate **emergent behaviour** that cannot develop by examining the individual behaviours alone.

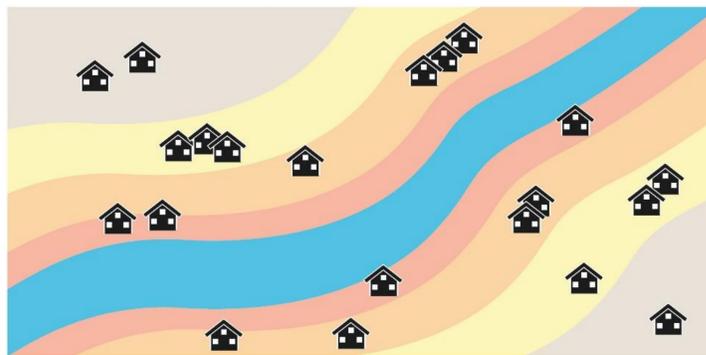


Fig. 1: Example simulation input of private households (agents) in different flood hazard zones

DATA

- Behavioural rules and decision paths are based on previous analyses of a panel data set (Bubeck et al., 2020, and Berghäuser et al., 2021, submitted)
- includes
 - 3 types of longitudinal behaviour patterns of adaptation
 - Flood-related variables: flood hazard zones (ZÜRS-Zonen by GDV, 2001)
 - Individual characteristics
 - Attitudes and perceptions
 - Ownership
 - Flood experience
 - Protection motivation
 - Perceived financial information and support

MOTIVATION AND OBJECTIVE

- Inclusion of **empirically based** longitudinal **precautionary behaviour** into an **ABM** that allows a prediction of adaptive behaviour of private households in flood-prone regions
- Application of a multidisciplinary approach to learn about feedback loops and trigger mechanisms for private flood adaptation

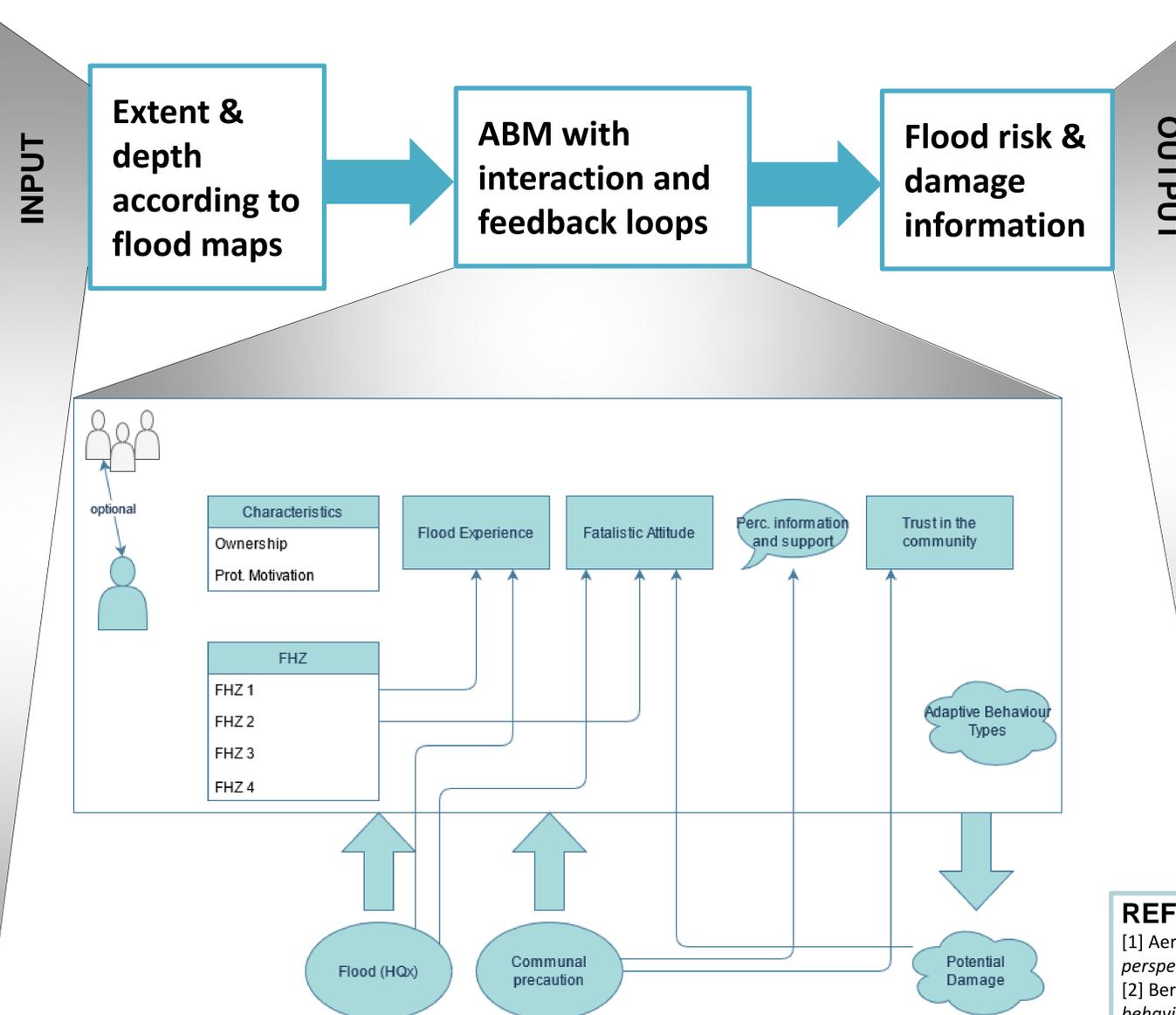


Fig. 2: Conceptual design of an ABM for flood risk assessment and management (currently under development)

POTENTIAL DAMAGE

$$\text{logit}(L) = f(w + d - a + C + I - Bt)$$

Based on Mohor et al. (2020) with:

- L – loss ratio [%]
- W – water depth [m]
- d – duration [h]
- a – building area [m²]
- C – contamination [-]
- I – state of insurance [-]
- Bt – adaptive behaviour according to individual behaviour type (Berghäuser et al., 2021, submitted)

OUTLOOK

- Validation of the model using damage data from the panel data set is foreseen.
- Collaboration with Institute for Environmental Studies (IVM): model implementation (ongoing)

REFERENCES (Selection)

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