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Theoretical foundations of human decision-making in agent-based land use models - a review

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Abstract: Recent reviews stated that the complex and context-dependent nature of human decision-making resulted in ad-hoc representations of human decision in agent-based land use change models (LUCC ABMs) and that these representations are often not explicitly grounded in theory. However, a systematic survey on the characteristics (e.g. uncertainty, adaptation, learning, interactions and heterogeneities of agents) of the representation of human decision in LUCC ABMs is missing. To inform this debate we performed a quantitative review of 134 LUCC ABM papers using a standardised questionnaire with a particular focus on the characteristics and the theoretical foundation of human decision-making. Thereby, we investigated whether implementations of human decision-making in current LUCC ABMs are theory based. Additionally, we assessed to which degree key factors such as learning, interaction or economic, environmental or social influence factors are considered in human decision making sub-models. We show that most human decision sub-models are not explicitly based on a specific theory and if so they are mostly based on economic theories. In contrast, promising psychological theories such as the theory of planned behaviour are the exception. The key factors of human decision sub-models showed a huge diversity and are not strongly related to neither the characteristics of the specific studied systems (e.g. rural vs. urban or its geographic location) nor the applied theoretical paradigm. We finish by presenting approaches for consolidating and enlarging the theoretical basis for modelling human decision-making.

Keywords: adaptation; heterogeneity; human behaviour; learning; multi-agent systems; ODD+D