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## How complicated agent-based models should be?

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**Abstract:** Agent-based models (ABMs) are increasingly used to model human-environmental systems, in particular in natural resource management. The decision-making of agents is the core of ABMs. However, the human decision-making can be very complicated—influenced by various factors, such as personality, education, natural endowment, financial status; various theories from physiological, social, or economic perspectives have been employed to describe and explain human behaviours. One of the most puzzling question for ABMs and their modellers is how realistic and detailed the agents need to be modelled to catch the complexity of the human decision-making, while keeping the model simple and tractable. There are polarized opinions: one is that agents in ABMs are too simple and naïve and ABMs thus cannot be taken seriously in addressing real problems in natural resources management; therefore, the agents behaviours needs to be realistic and descriptive. The other opinion is that the complexity of the model behaviours increases exponentially over the complicatedness of agents' behaviour; therefore, the agents should be modelled as simple as possible to make the whole model tractable. Modellers therefore face the tough choices when building ABMs for natural resources. In this research, we present a synthesized discussion out of the last iEMSs workshop. Based on the trade-offs analysis between these simple and complicated models, we argue that ABMs should be constructed as simple as possible but as complicated as necessary to address the predefined research questions. Pattern-oriented modelling, stepwise approaches, and modular design approaches can guide and help modellers in choosing the appropriate level of complicatedness.

**Keywords:** empirically grounded models; pattern-oriented modelling; stepwise approach; complexity; decision making