

Visualizing ABM Submodels to Promote Stakeholder Participation: A look into Sustainable Forest Operations

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Over the years, there has been an accumulation of different agent-based models (ABM) dedicated to forest resource management. However, only a few have been used in the implementation of real-world decision-making applications. One reason for this is the low level of stakeholder engagement in model development. There is still a significant gap between the stakeholders' understanding of the socio-ecological system and its corresponding representation as a process in a simulation model. In order to bridge this gap, it is necessary to communicate to the stakeholders the actual processes taking place in the simulation model. In this study, we developed an agent-based model of a sustainable forestry operation that investigates the Selective Logging system and Assisted Natural Regeneration as a sustainable wood harvesting practice. A theoretical forest based on a real forest inventory was used, and foresters and economists participated in the development and validation of the simulation model. In order to involve the different stakeholders, a graphical tool for visualizing the processes and sub-models of the simulation model was developed. The Overview, Design Concepts, and Details (ODD) is an established protocol to describe ABMs that facilitates communication within and across disciplines. Various tools are already available to describe the "Overview" requirement, but much work remains to be done in communicating the "Details" section, particularly the submodels. In this regard, we explored the use of Business Process Modeling Notation (BPMN) and extended it to include the specification of stakeholder interest in individual processes and submodels. BPMN is a *de facto* standard for business process diagrams, and there is growing interest in using it to document ABMs. In addition, stakeholder interests were used to identify important strategic points in the simulation model. The graphical tool was implemented as a plugin for the GAMA platform.

Keywords:

Submodels; Sustainable wood harvesting; Stakeholder participation; BPMN; GAMA plugin

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