

## **Analysis of Existing Methods for Translating Qualitative Narrative Scenarios of Land Use Change into Quantitative Inputs for Model Simulations**

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Land use and land cover change (LUCC) simulation models can help identify future pathways of land use when used for scenario analysis. This entails the creation of alternate narrative land use scenarios followed by their simulation using LUCC models. Narrative scenarios are qualitative descriptions of plausible futures resulting from a combination of various socio-economic, policy, ecological and climate changes. Recent studies follow participatory processes in which stakeholders' engagement during the scenario development phase is essential for designing narrative storylines that capture stakeholder and expert knowledge and ensure that the scenarios are relevant for the end-users (van Vliet, Kok, & Veldkamp, 2010). LUCC models can transform the qualitative narrative descriptions into quantified estimates or descriptions of future states under various scenarios. These quantified estimates can then be used to compare between the outcomes of various scenarios to make judgments about which to pursue. To enable successful decision making, LUCC models of these scenarios require quantified inputs that need to be translated from narrative scenarios (Amer, Daim, & Jetter, 2013; Castella, Trung, & Boissau, 2005; Kok et al., 2015; Rounsevell & Metzger, 2010). The process of this translation needs to faithfully characterize the qualitative scenario descriptions and be reproducible and internally consistent.

This paper starts by reviewing the existing translation methods. It creates a typology based on the various methods used for stakeholder and expert knowledge elicitation during the translation process. Then, it discusses the common translation methods to identify current best practices and strengths and weaknesses of each method based on specific criteria. It studies the various translation approaches in terms of the LUCC models with which they are most compatible. The various translation methods are also studied in terms of their applicability for different systems under study. For example, what methods are most suitable when the objective of the modeling exercise is to share a common land resource, in which bottom-up decision making processes are likely to predominate? In contrast, what methods would be more suitable when top-down policy making decisions have a larger impact on desirable future land use changes and local stakeholders have a limited impact on the future of the land? Consequently, the paper also addresses how the choice of participatory and non-participatory methods that seek to limit or enhance stakeholder involvement are linked to the governance scheme and the issues that need to be addressed. Three of the presented methods are further discussed and compared in detail based on the results of a stakeholder workshop in which participants were divided into three groups and used different methods to translate scenario narratives to quantitative inputs for simulation models. In this way, a real and simplified example was used to test and refine our framework of analysis. The results of the stakeholder workshop are also used to identify criteria of success for different methods. The analysis ultimately leads to the development of a framework based on

tested criteria of success that can assist scenario developers and modelers in the choice of an appropriate translation method.

### **Literature Cited**

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