EFFECTS OF COMBINING SOCIAL AND HYDROLOGICAL FACTORS IN WATER SCARCITY-INDUCED MIGRATIONS: APPLICATION TO A "TOY" AGENT-BASED MODEL

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Human migration, especially induced by water scarcity, is a by-product of social and hydrological factors. Many previous studies of the migration problem have emphasized that social and hydrological factors must be framed together to generate a useful model. However, we lack a theoretical background on how to incorporate the two factors. In this research, we present three examples of theoretical factor configuration for the migration. First, ADD configuration stands for the perfect substitutability between social and hydrological factors. Second, both of two factors are needed in AND configuration. Third, OR configuration is that either factor is enough. Based on this setting, our research questions are: 1) How important is the factor configuration of social and hydrological factors to outputs relative to other inputs?; 2) How do different factor configurations change migration patterns and model outputs?; and 3) Does different factor configuration require different ways of management? We develop a "toy" agent-based model (ABM) of water scarcity-migration to answer these questions. To analyze ABM results, we apply global sensitivity analysis (GSA) and Monte-Carlo Filtering (MCF). GSA identifies which input is relatively the important inputs controlling model outputs. The technique checks whether we should consider how the factors are incorporated. Then, MCF translates ABM-GSA results in terms of management to learn how policymakers should control the inputs. This integrated framework of ABM, GSA, and MCF fosters a better understanding of the migration problem, disentangling complex human-water interactions.

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