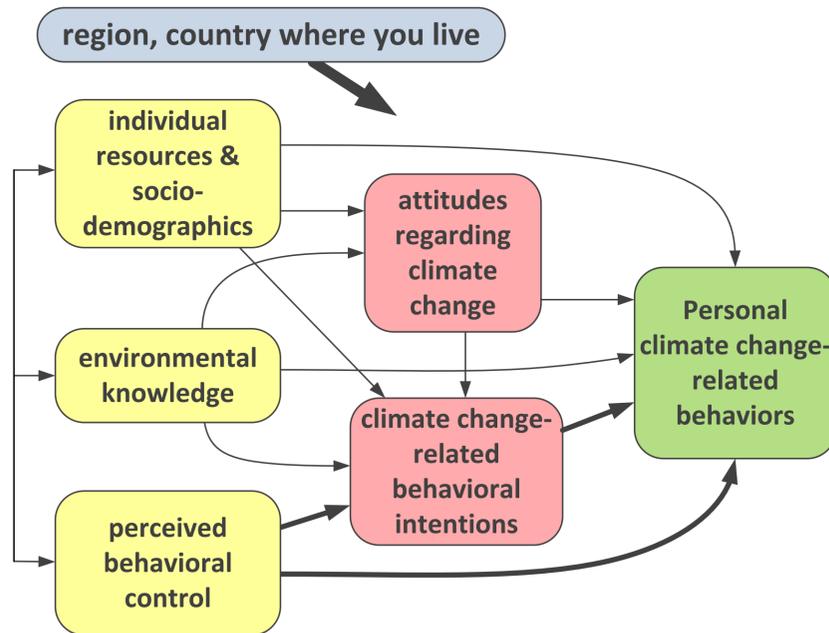


Modeling: A Tool for Addressing the Challenges of Climate Change

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Hierarchical Linear Modeling allows researchers to explicitly represent context in empirical research. Hierarchical data structures contain variability at multiple levels like individuals clustered within families, neighborhoods or countries.

Structural Equation Modeling provides researchers with methods to incorporate complex relationships among variables by specifying causal pathways or chains of influence. For example:



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Why Modeling?

Climate change is a problem that involves large and complex systems. We can't run tests on these systems in a laboratory, so we have to use simplifications, or models, to ask questions about them. Most people have heard of the Global Climate Models that forecast the future state of the climate system, but several other types of modeling are also used in climate change research. Some, like the modeling tools described here, depict human behavior as well as natural system behavior.

Who Uses Modeling?

Policymakers use modeling to examine the potential consequences of policy decisions.

Scientists use modeling to develop and test hypotheses about natural or human systems.

Planners use modeling to test their plans against future changes in climate, demographics, and other factors.

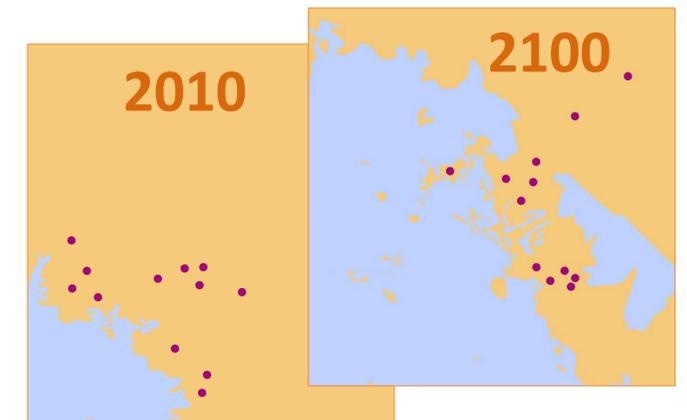
MSU Modeling Cluster

To address climate change and other global environmental problems, students will need to be trained in the most cutting-edge tools for systems analysis.

We are proposing a graduate modeling cluster of courses that give students a solid foundation in the modeling techniques described here.

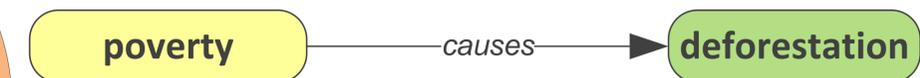
As a culmination of their training, students would use modeling to address a policy or research problem.

Agent-Based Modeling investigates the interactions between multiple decision makers and their shared environment, focusing on system-wide properties emerging from disaggregated individual behavior. For example, we can explore human migration due to sea level rise:



System Dynamics Modeling focuses on feedback loops, stocks and flows. It is most appropriately used to examine and forecast the behavior of a complex system in which variables may be influencing each other. Below is an example of a linear versus a dynamic hypothesis about deforestation:

Linear hypothesis:



Dynamic hypothesis:

