# The need for regulation of climate subsystems

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**Abstract**

We study how Earth subsystems, such as the Amazon rainforest, interact with global climate change through their internal dynamics, heterogeneously amplifying aggregate risk. Our framework captures the long-term value of marginal changes in subsystem states, including feedbacks, via a reduced-form model reflecting realistic geophysical processes. In our quantitative application, explicitely modeling Amazon dynamics raises the global social cost of carbon (SCC) by approximately 6% and implies a marginal value of local carbon storage that is about 33% larger than conventional estimates. This implies that a marginal ton of carbon stored in the Amazon rainforest is 25% more expensive than another type of carbon emissions. These results highlight the need for global climate policy and local conservation to recognize subsystems as dynamically vulnerable systems rather than static stocks.

**Keywords** : dynamic stochastic climate-economy model, robust environmental policy, Amazon rainforest, climate tipping elements, scientific uncertainty, risk.

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