# Modeling Climate Damage on Capital: Reconstruction Dynamics and Investment Allocation in Growth Models

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**Abstract**

This paper develops a framework for modeling climate damage directly on capital stocks in long-term multi-regional, multi-sector growth models. We decompose capital into potential stock and an integrity factor representing the undamaged fraction, with investment split between expansion of new capacity and reconstruction of damaged capital. In the baseline formulation, we show that the allocation between new investment and reconstruction does not affect the equilibrium paths of capital, output, or consumption—the optimizer faces no trade-off between investment types. We then introduce several mechanisms that create distinct roles for reconstruction: direct welfare effects from capital damage, differential gestation lags, higher returns from restoring damaged capital (which earned average rather than marginal productivity), sectoral bottlenecks, location-specific infrastructure, supply chain amplification, and labor displacement from housing destruction. These channels differ in whether they generate reconstruction preferences, capacity constraint effects, or both, and have distinct implications for shock persistence and consumption-investment dynamics.

*JEL classification*: Q54, E22, O44

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