

A coupled physical and economic model of the response of coastal real estate to climate risk

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Abstract

Barring an unprecedented large-scale effort to raise island elevation, barrier-island communities common along the US East Coast are likely to eventually face inundation of the existing built environment¹ on a timescale that depends on uncertain climatic forcing. Between the present and when a combination of sea-level rise and erosion renders these areas uninhabitable, communities must choose levels of defensive expenditures to reduce risks and individual residents must assess whether and when risk levels are unacceptably high to justify investment in housing. We model the dynamics of coastal adaptation as the interplay of underlying climatic risks, collective actions to mitigate those risks, and individual risk assessments based on beliefs in model predictions and processing of past climate events. Efforts linking physical and behavioural models to explore shoreline dynamics^{2, 3, 4} have not yet brought together this set of essential factors. We couple a barrier-island model with an agent-based model of real-estate markets⁵ to show that, relative to people with low belief in model predictions about climate change, informed property owners invest heavily in defensive expenditures in the near term and then abandon coastal real estate at some critical risk threshold that presages a period of significant price volatility.