



Climate Risk Assessment Framework for Real Estate Investments

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Climate change is forming an increasingly larger risk for the financial sector, although climate-related financial risks may be underestimated by financial institutions and markets. Financial institutions, such as banks, pension funds, and insurers are mainly exposed to physical climate risks through their investments in real estate. In the absence of any adaptation actions, physical climate risks for these real estate investments are expected to increase because of the higher frequency and intensity of natural disasters in a changing climate. In response to the increasing financial risks associated with climate change, regulatory bodies have been actively shaping new legislation over the past years (e.g. TCFD, CSRD, EU Green Taxonomy).

One of the main channels through which the financial sector is affected by flood risk is through physical damage to real estate. After this physical damage, housing prices decrease, and houses located in flood-prone regions sell with a discount compared to similar houses in other areas. Additionally, the credit standing of households diminishes, making mortgages more likely to default, increasing mortgage credit risks for lenders. The 2008 global financial crisis has shown that real estate and its underlying values are a pivotal part of the modern financial system. For this reason, it is imperative to monitor and assess how flood risk affects real estate markets and investors through both direct and indirect channels.

These impacts from flooding are currently not yet fully integrated within the risk assessment framework of institutional investors. Dynamic integrated models for insurance markets do exist in the literature, where standard catastrophe flood risk models are matched with insurance sector outcomes. There is currently no clear overview of how physical climate risks affect the balance sheets and profitability of (institutional) real estate investors. This study provides a structured integrated framework for evaluating both the direct and indirect flood-related risks associated with investments in both residential and commercial real estate. Although our bottom-up Dynamic Integrated Flood Real Estate Impacts (DIFREI) model can be applied to other international contexts, we use a real estate portfolio from one of the largest financial service providers in the Netherlands to illustrate the framework's use and outputs. The DIFREI models can be used to draw lessons for applications on real estate investment portfolios.