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The Impact of Climate Change on Estate Prices

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Abstract: As global climate change intensifies, extreme weather events, sea level rise and persistent droughts have become major challenges to the economic development of countries. Climate change not only affects ecosystems, but also has far-reaching impacts on urban economies, real estate markets and asset values. Real estate, as a typical long-term asset, is highly sensitive to environmental changes, so it is of great academic value and practical significance to study how climate change affects the real estate market, especially the volatility of house prices in different regions. This thesis provides an overview of the mechanisms by which climate change affects real estate market prices, explores how different types of climate risks act on real estate markets globally, and analyses the impacts of regional differences, policy interventions and market psychology on house price changes. In addition, the paper points out the gaps and deficiencies in the current research and proposes directions for future research.

Keywords: Climate Change; Property Market; House Price Volatility; Climate Risk; Regional Differences; Transition Risk; Satellite Data; Market Psychology

1. Research Background

Climate change is one of the most significant challenges facing the world today, with global temperatures rising year after year, frequent extreme weather events, and rising sea levels. According to a report released by the United Nations Intergovernmental Panel on Climate Change (IPCC), global temperatures have already risen by about 1.1 degrees Celsius above pre-industrial levels and are projected to rise by more than 1.5 degrees Celsius by the end of this century. This change is not only impacting ecosystems, natural resources, and biodiversity, but also profoundly altering the global economic landscape.

As climate risks intensify, multiple areas of social and economic activity are experiencing unprecedented challenges. The real estate market, as a capital-intensive industry, is particularly sensitive. The immovability of real estate makes it impossible to easily escape the impacts of climate change, and its long-term holdings make the risks of climate change increasingly visible. In addition, the value of real estate is not only affected by market supply and demand, but also directly by environmental factors. Different manifestations of climate change (e.g. extreme weather, chronic risks, etc.) may lead to long-term discounts or the inability to trade properties, which in turn affects the stability and sustainability of the market as a whole.

Therefore, the characteristics of real estate as a climate-sensitive asset make it an important object in climate change research. By exploring how climate change affects the price volatility and value changes of real estate, it can provide an important decision-making basis for policy makers and investors. This study aims to provide insights into the mechanisms by which climate change affects real estate prices and to identify the research gaps that exist. As the social and economic impacts of climate change become more pronounced, the volatility and uncertainty of the real estate market are of increasing concern.

2. Mechanisms of Climate Change Impact on Property Prices

2.1 Climate Risk Premium

The climate risk premium refers to the asset value discount or the additional return required by investors due to risks associated with climate change. These risks include physical risks—such as sea level rise, floods, and extreme heat—and transition risks, such as carbon taxes, stricter environmental regulations, or shifts toward green technologies.

In the real estate sector, the climate risk premium is reflected in two main ways:

First, properties located in climate-vulnerable areas—such as coastal zones or low-lying

tropical regions—tend to have lower prices, as the market partially incorporates expected future damages into property valuations.

Secondly, investors and homebuyers facing climate-related risks often demand higher rental yields or capital returns to compensate for the potential losses and increased future costs (e.g., insurance or maintenance expenses).

2.2 Direct Physical Risks (Physical Risks)

Extreme weather events and chronic climate change brought about by climate change are the most significant physical risks. These risks typically affect the property market at both short and long term levels:

Extreme weather events: Natural disasters such as floods, hurricanes, wildfires, etc., usually have a short-term impact on property prices following a disaster. Many studies have shown that property prices tend to fall significantly after a disaster, especially in areas directly affected. For example, in certain coastal cities in the United States that have been hit by hurricanes, house prices typically fall by 10-20 per cent after a disaster (Bell et al., 2018; Kousky & Cook, 2017)[1,2]. This drop reflects post-disaster damage to properties and the market's reassessment of future risks.

Chronic climate risks: the impacts of long-term climate change, especially chronic risks such as sea level rise and sustained high temperatures, usually have a long-term impact on property prices. For example, sea level rise is already depressing property values in coastal areas in some coastal cities, and the 'climate risk premium' for property is becoming an important factor in price determination (Huang et al., 2021; Cobián Álvarez et al., 2019)[3,4] . One study suggests that the market value of properties located in high-risk areas (e.g., low-lying coastal zones) may be discounted in the long term due to expected climate change (McEvoy & Lund, 2020). [5]

2.3 Indirect Transition Risks (Transition Risks)

Climate change not only affects the property market through physical risks, but also indirectly through transition risks such as policy and technological change:

Climate Policies: With the advancement of global climate action, many countries and regions have introduced policies on carbon emissions, energy efficiency, and so on. For example, governments may impose carbon taxes or implement building energy efficiency standards, resulting in a dampening of the value of high-emission assets such as older buildings. For some properties that do not meet environmental standards, investors may avoid the market for them, leading to lower prices for this asset class (Mayer et al., 2019; Glaeser & Gyourko, 2018)[6,7].

Shift in investor preference towards "green buildings": as environmental awareness and the concept of sustainability increase, more and more investors are inclined to invest in green-certified buildings (e.g. LEED-certified buildings). This trend has resulted in a premium for green buildings. For example, in some markets, the rents and selling prices of green buildings are significantly higher than those of regular buildings, especially in climate change-sensitive regions, and the demand for green buildings is gradually increasing, which is driving the transformation of the real estate market (Jain & Sharma, 2020; Pivo, 2020). [8,9]

2.4 Market Psychology and Expectations

The impacts of climate change are not only transmitted through actual physical or policy risks, but are also reflected in property prices through the psychology and expectations of market participants. Market perceptions of and reactions to climate risk amplify property price volatility to some extent.

Amplification of climate risk perceptions: With the frequency of climate change-induced disasters, media and public attention to climate risk is increasing. This attention tends to have an impact on the property market through the 'risk labelling effect'. When an area is labelled as "climate risky", investors may become more conservative in their expectations, leading to fluctuations in property prices. For example, some coastal cities have seen investors become wary of property in the region due to frequent tsunamis or floods, leading to a decline in house prices (Kousky & Cook, 2017; Eichholtz et al., 2020). [2,10]

Rising insurance costs: the increase in extreme weather events due to climate change has also led to a significant rise in the cost of property insurance in some areas. This increased cost has a direct impact on the demand for homeownership, especially for buyers who rely on low-cost insurance. For example, in flood-prone areas such as Florida, many

homebuyers have had to forgo purchases due to soaring insurance costs, which has indirectly impacted activity and price levels in the property market (Vickery et al., 2021; Brody et al., 2018). [11,12]

3. Differences between Developed and Developing Countries

Developed country property markets: more sensitive to climate change responses

USA: In America, some areas that are more threatened by hurricanes, such as Texas or Mississippi, have seen an increase in hurricane risk year-on-year, leading to price declines in some real estate markets. From Lin and Cha (2025)[11], the loss ratio is defined as the fraction of hurricane-induced residential losses over the total asset exposure (in dollars). This ratio enables quantification of expected dollar losses under climate change scenarios, where, for example, a 10% loss ratio in a $5 billion exposure zone corresponds to $500 million in projected damages. Based on their neural network-based surrogate model to estimate hurricane-induced residential building losses. The model defines the *loss ratio* as the total building and content loss over total exposure, with estimates evaluated at the census tract level. Under IPCC RCP8.5, several coastal counties—such as Miami-Dade and Charleston—are projected to see wind and rain-ingress loss ratios rise by 56% to over 100%."

Property markets in developing countries: climate change risk underestimation

Southeast Asia (e.g. Thailand, Philippines): The potential impacts of climate change are not adequately priced in the property markets of some developing countries. Particularly in regions where there is a lack of valid climate data and policy regulation, climate risks may be underestimated. For example, in some areas of the Philippines, the property market has lagged in its response to natural disasters such as tsunamis and typhoons due to the lack of strong climate adaptation measures and insurance. Some coastal cities experienced short-term declines in house prices of **5-8 per cent** after disasters, but the market recovered relatively quickly as climate risks were not fully reflected.

Indonesia:

In some coastal cities in Indonesia, the property market has not significantly reflected climate risks despite frequent exposure to extreme weather from climate change (e.g. floods and typhoons). Parts of Jakarta, for example, have experienced relatively small changes in house prices after several major flooding disasters, with fluctuations only about **0.1%**per**1% rising sea level. (Cobián Álvarez & Resosudarmo, 2019)[4]

Conclusion

The above case studies and data analyses show that the impact of climate change on the property market is not only directly influenced by physical risks, but is also closely related to the adaptability of the region, the policy response, and the level of awareness of climate risks among market participants. Property prices in high-risk regions typically experience significant declines, while low-risk regions or those with strong climate resilience are likely to benefit from a climate migration dividend and show an upward trend in house prices. Markets in developed countries are usually more effective in pricing climate risks, while markets in developing countries may underestimate these risks due to regulatory failures.

4. Research Methodology and Modelling

In analysing how climate change affects property prices, scholars have used a variety of quantitative and qualitative methods. These methods can help identify the pathways of climate change impacts, assess the role of different types of risks on the property market, and shed light on the long-term effects of climate change. Below are several mainstream analytical models and approaches.

4.1 Mainstream Analytical Models

Hedonic Pricing Model (HPM)

The Hedonic Pricing Model (HPM) is one of the commonly used methods to analyse the impacts of climate change on the real estate market. The model analyses the impact of different features on property values by considering property prices as a weighted average of multiple features (e.g. geographic location, architectural features, climate risk, etc.). In climate change research, HPMs are commonly used to assess the impact of climate risk-related features on property prices. For example, researchers can use climate factors such as flood risk, storm risk, sea level rise, etc. as model variables to test how these factors affect the price level of properties in a given area

(Kousky & Cook, 2017)[2].
Benefit: The model is able to capture the micro impacts of climate change on property prices and can be compared across multiple scenarios.
CHALLENGE: HPM requires high-quality data, especially climate risk data, which may be difficult to obtain in some regions. In addition, the long-term impacts of climate risk may not be fully captured by existing models.
Differences-in-Differences (DiD)
Differences-in-Differences (DiD) is an econometric method commonly used in policy evaluation to analyse the impact of climate change on house prices by comparing changes in house prices across time and regions. The method is commonly used to compare the difference in house prices between areas affected by a climatic event and an unaffected control group. For example, the short-term impacts from climate change can be estimated by comparing changes in house prices before and after a hurricane strikes, or after a flood versus a non-affected area (Bell et al., 2018). [1]
Strengths: The DID approach is able to handle heterogeneity across regions and clearly identifies short-term shocks to house prices from climate events.
Challenges: this approach relies on the selection of an appropriate control group and requires that the time horizon of the data is long enough to assess the recovery of the market after a disaster.
Panel Data Models (PDMs)
Panel Data Models combine time-series data with cross-sectional data, enabling the analysis of property market performance across time and across regions. The methodology is suitable for studying the dynamic impact of climate change on the property market, especially when the impact of climate risk needs to be analysed across regions and over time. For example, panel data models can be used to analyse how climate change has different impacts on property markets in different regions and to examine how these impacts vary over time (Huang et al., 2021). [3]
Advantages: able to control for fixed effects in different regions and provide a comprehensive analysis of multidimensional data.
Challenges: Panel data models require high-frequency temporal data and broad regional coverage, and data integrity is critical.
Structural Equation Modelling (SEM)
Structural Equation Modelling (SEM) analyses the causal relationships between multiple variables, and in climate change research, it can be used to build a complex network of relationships between climate risk, market psychology, policy responses and property values. Through SEM, researchers can explore how climate risk affects the property market through multiple pathways, e.g. climate risk affects house prices through channels such as investor expectations, insurance costs and government policies (Pivo, 2020)[9].
Advantage: SEM is able to handle multiple latent variables and causal pathways, and is suitable for analysing complex socio-economic systems.
Challenges: model construction and parameter estimation are complex and have high data requirements, especially for sample size and accurate measurement of variables.

4.2 Data Challenges

Although the above methods provide powerful tools for assessing the impacts of climate change on the property market, in practice, data collection and quality remain a major challenge.
Uncertainty in climate data
A central issue in climate change research is the uncertainty of climate data. Different climate models (e.g., RCP scenarios) give widely varying projections, which makes it difficult to accurately predict the long-term impacts of climate change (Vickery et al., 2021) [11]. Therefore, when using these data, researchers need to consider the risks in different scenarios and test the sensitivity of the models to different assumptions through sensitivity analyses.
Granularity issues in real estate data
Another challenge in real estate market analysis is the issue of data granularity. Many climate change studies rely on macro-level real estate data (e.g., annual averages of regional house prices), however, the impacts of climate change are often more significant at the micro level. Therefore, the lack of high-frequency, micro-level (e.g., property-specific transaction data) real estate data limits the depth of research (McEvoy & Lund, 2020) [5].
Difficulty in projecting climate risks
Climate change projections not only involve changes in future climate patterns, but also need to consider regional adaptive capacity. For example, certain regions may be able to reduce the impact of climate risk on house prices due to adaptation measures such as the construction of flood walls and improving the weather resistance

of buildings. Therefore, predicting the specific impacts of climate change on property needs to consider the role of these policies and adaptation measures (Jain & Sharma, 2020)[8].

5. Conclusion

The impacts of climate change on the property market are multidimensional and involve a number of aspects such as physical risk, transition risk, and market psychology. Although a large number of studies have explored the relationship between climate change and the property market, there are still significant research gaps in many regions, methodologies and theories. Future research should further extend regional coverage, strengthen analyses of long-term dynamic impacts, and explore how emerging technologies can help improve the accuracy of climate risk assessments. Interdisciplinary collaboration, especially the integration of climate science and property economics, will provide more opportunities and perspectives for in-depth research in this area.

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