

## Another climate change casualty: property prices

Climate change increases the likelihood of physical housing damage, which impacts the market value of people's homes. In this article, we explore the role climate change currently has on the housing market and how this could change in the future



Homeowners will face increased costs due to climate change, such as flooding

The pace of global warming is accelerating faster than previously predicted. It is likely that global warming will reach the 1.5-degree mark, which climate experts regard as the critical limit, as soon as 10 years from now.

In the Netherlands, climate change is causing higher temperatures, more frequent droughts, intense and prolonged precipitation, both locally and in border areas, and, in the long term, rising sea levels. The adverse effects of this are diverse and potentially large: heavy precipitation increases flood risks, drought can lead to drinking water and food shortages, as well as pile rot, and sea level rise can make parts of the Netherlands uninhabitable.

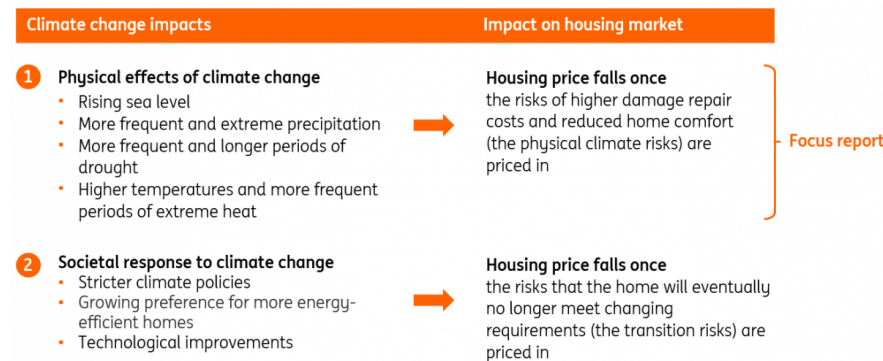
The pressure to combat climate change is increasing globally; world leaders signed the Paris

Climate Accord in 2015, agreeing to limit global warming to well below 2 degrees Celsius (and preferably 1.5 degrees).

Both climate change and the societal response to combat climate change are affecting the housing market. We explain why below.

## Climate change creates risks that could affect housing market

Expected impacts in the Netherlands



Source: KNMI, Dutch Central Bank, ING Research

## Climate change eventually impacts housing prices

Climate change increases the likelihood of physical housing damage. In addition, housing – via household energy consumption – causes contributes to global CO2 emissions. The housing stock is therefore partly responsible for global warming. Climate change thus affects the housing stock and vice versa. Risks arise from this in both directions, which can ultimately affect property prices. It is important for investors, housing associations and owner-occupiers to understand the climate risks of their housing assets, because pricing in these climate risks can lower the market value of their homes.

## Climate change increases physical risks on the housing market

Expected impacts in the Netherlands

Climate change impacts	Effects on physical climate risks on the housing market
Rising sea level	<ul style="list-style-type: none"> <li>• Risk of flooding increases</li> </ul>
More frequent and extreme precipitation	<ul style="list-style-type: none"> <li>• Risk on waterlogging increases</li> </ul>
More frequent and longer periods of drought	<ul style="list-style-type: none"> <li>• Risk of subsidence increases</li> <li>• Risk of pile rot increases</li> </ul>
Higher temperatures and more frequent periods of extreme heat	<ul style="list-style-type: none"> <li>• Risk of reduced home comfort due to heat stress increases</li> <li>• Risk of fire damage from wildfire increases</li> </ul>

Source: KNMI, Dutch Central Bank, ING Research

### 1. Increased physical climate risks

Climate change increases the likelihood of physical housing damage. More frequent very hot days create more heat stress and increase the risk of wildfires, more drought increases the likelihood of foundation damage, and extreme precipitation and sea level rise increases the likelihood of flooding.

Repairing and preventing damage, or mitigating nuisances caused by this damage, increases the expected cost of home ownership. For homeowners, this poses two risks. First, homeowners will face increased costs due to climate change, such as flooding. Second, climate change puts homeowners at risk of a decline in the market value of their homes. When market participants (home buyers, insurers or banks, etc.) factor the expected costs of physical climate damage to homes into (purchase) decisions, this puts downward pressure on home prices.

## Transition risks: increased likelihood of housing price decline due to societal response to climate change

Societal response to climate change	Explanation
Stricter climate policies	<b>Example:</b> stricter standards will increase the required investment costs of the least energy-efficient homes most.
Growing preference for more energy-efficient homes	Households, investors and shareholders will demand ever higher energy-efficiency standards for homes.
Technological improvements	<b>Example:</b> if the cost of heat pumps declines, the financial attractiveness of moving away from natural gas increases.

Source: Dutch Central Bank, ING Research

### 2. Increased transition risks

Growing awareness about the negative social impacts of climate change increases government and market efforts to combat climate change (in order to mitigate its negative impacts). This will reduce the demand for less sustainable homes over time, and put downward pressure on the price of these homes via three channels.

First, climate policy is relevant here. For example, starting in 2030, housing corporations and private landlords in the Netherlands will no longer be allowed to rent out homes with energy labels E, F and G. This will require additional investment in these homes to comply with regulations and depress the prices of less sustainable rental homes.

Second, the intrinsic preference of market players over time is expected to increasingly favour sustainable housing.

Third, new technologies will enter the market that make sustainability more attractive. These developments will cause less sustainable homes to (further) decline in popularity and decrease in value. Academic research already shows that in the Netherlands, the energy efficiency of homes already has a direct effect on the selling price.

## Climate risks increase likelihood of sudden drop in house prices

This research focuses on the question of why physical climate risks are still limitedly priced into the

housing market, while globally the climate-related damage burden is growing. This poses a downward risk for house prices and hence entails negative financial risks to homeowners, professional housing investors and the financial sector. For them, it is therefore relevant to understand why the role of physical climate risks in the housing market is currently small and when this may change.

We address three questions in this publication:

1. What is known about the pricing of physical climate risks in the housing market?
2. What can explain the limited role of physical climate risks on housing prices?
3. How might this change in the future?

## 1 The role of physical climate risks on the housing market is currently still limited

There is little research on the impact of physical climate risks on the housing market. Based on existing studies, the impact of these risks is rather small.

### Higher flood risk does not depress house prices...

In the Netherlands, for example, research suggests that homes with a higher flooding risk are not sold at a lower price than homes where this risk is lower. One explanation is that –apart from entailing a risk – people also associate the proximity of water with a nicer living environment.

### ...but after a flood occurs, homebuyers do pay less

After a flood occurs, it does affect housing prices. This is shown by two studies on the effect of floods in Limburg between 1993-95 on house prices in flood-prone areas along the Meuse River. The first study concludes that these houses were sold at a price discount of 10.9% on average after the floods, and that this price effect wears off after about a decade. The second study finds a price discount of about 9% for affected homes.

### Natural disasters affect house prices (United States)

Multiple studies on the impact of physical climate risks on house prices in the United States show that these risks put downward pressure on prices. For example, Ortega and Taspinar (2018) found that Hurricane Sandy (in 2012, including on the east coast of the US) had a long-lasting negative effect on house prices in New York. For an extended period after the hurricane hit, New York property prices were discounted, even for homes that had not suffered damage from the hurricane.

The role of flood risk on house prices in the US is less clear-cut. While research by Bernstein, Gustafson and Lewis (2019) found a price discount for homes in flood-prone areas, analysis by Murfin and Spiegel (2020) did not. Researchers find two explanations for the different outcomes: first, many home buyers are not yet well informed about physical climate risks and therefore do not factor these risks into their purchase decisions. This is especially true for private home buyers. As a result, the impact of physical climate risks on house prices can be found to be minor in some areas. A second explanation is that growing awareness about physical climate risks first translates into fewer sales of homes with higher physical risks, and only with a lag trickles down to house prices. This is because it takes time for existing homeowners to lower the price they want to accept for their homes in response to lacking demand.

The limited role of physical climate risk on house prices is not surprising, given the three hurdles for

pricing in these risks that we discuss below.

## 2 Three explanations for the limited role of physical climate risks in the housing market

There is a lacking sense of urgency about physical climate risks. These risks are difficult to estimate and there is a lack of knowledge about the potentially high own financial risk in case of climate-related housing damage. Three hurdles currently limit the role of physical climate risks in the housing market.

### Three obstacles hinder the pricing in of physical climate risks



Source: ING research

#### 1. A sense of urgency about physical climate risks is lacking

Consumers and businesses typically do not take into account physical climate risks in home-buying decisions, even though climate change has been labelled several times as one of the greatest challenges facing humanity. The same holds true for the housing market. Behavioural scientists find three explanations for this contradiction.

- Not enough context to assess physical climate risks: the probability of a natural disaster is small, but the consequences when it happens are potentially very large. Research shows that people find it difficult to assess small-chance events, even when their expected impact is very large. The reason for this is that we cannot directly relate these small probabilities to (more common) events with which we are more familiar. It is, for example, hard to properly understand the difference between a 1/3,000 or 1/30,000-year flood probability because people lack the required context to interpret the difference between these two risks. This is why a behavioural response to physical climate risks often fails to occur. This may also explain why home buyers do not factor physical climate risks into their purchase decision.
- Concern about physical climate risks is absent: most people will run away from fire and decide to take a different route than that small alley with a perceived higher chance of being robbed. This is because the emotions that we feel at these events trigger these reactions. The importance of feelings in assessing risk in eliciting a response is evident from research. These emotions are still lacking when assessing physical climate risks. One explanation for this is that most people have not experienced the devastating effects of natural disasters up close. As a result, we think about physical climate risks as a rather abstract concept, without feeling the necessity to change our behaviour in response to these risks.
- Present bias (hyperbolic discounting): people tend to value the present more than the future. Climate risks often seem "far away" to consumers now. As a result, they tend to grasp the physical consequences of climate change too late. In the Dutch housing market, for example, much of the attention of investors and housing corporations is focused on

solving the structural shortage of affordable housing and making the housing stock more sustainable. Dealing with the physical consequences of climate change is seen as something for later. The limited financial resources and capacity of corporations also play a role here.

## 2. High search and information costs (and little time)

Estimating the physical climate risks of a home is not an easy job and takes a lot of time. A standard methodology is not available and there is a lack of (good) data. In addition, the major uncertainties surrounding the impact of climate change hinder a good risk assessment. At the same time, home buyers experience time pressure when making their purchase decision. The high search and information costs for estimating physical climate risks partly explain why home buyers now price physical climate risks only to a limited extent.

- **Complex analysis:** estimating physical climate risks is largely uncharted territory and no easy task. No standard methodology yet exists for estimating physical climate risks. Because providers of physical climate risk analysis use different methods, they often estimate these risks differently. Estimating the expected housing damage from a climate event (e.g., flooding) requires many partial steps. Moreover, physical climate risks depend in part on specific housing characteristics.
- **Existing data not granular enough:** proper estimates of physical climate risks require local climate data. Existing datasets are often not available at the right scale, or sufficiently robust. Existing data is often focused on regions while estimating the physical climate risks of a property requires local data. Gathering more local data is possible, but time-consuming (and thus costly).
- **Large uncertainties:** risks, by definition, look at the future. Some uncertainty in making a risk assessment is therefore not unknown. However, climate change expectations are surrounded by very large uncertainties; our climate consists of a complex system, with self-reinforcing effects and tipping points that are difficult to predict. Hence, climate scientists also distinguish different scenarios with different climate effects. The large uncertainties surrounding the effects of climate change mean that the margin of uncertainty surrounding estimated physical climate risks in the housing market is also large. This makes it difficult for home buyers to factor these risks into their purchase decisions.

### Home buyers experience time pressure

The high search and information costs of estimating physical climate risks contrast sharply with the time pressure home buyers typically experience when buying a home. After all, each home is unique, and home buyers often have a strong preference for a particular location. The risk that the home you are looking for will no longer be available if you wait too long makes home buyers feel some urgency in making a decision. In a heated market, the pressure buyers experience will be even greater. Given this context, it is not surprising that home buyers consider physical climate risks in the housing market only to a limited extent.

## 3. Insufficient knowledge of potentially large own risk

Households and professionals in the housing market are far from always aware of the financial risk they face in the event of climate-related damage. They are often unfamiliar with the policy conditions of their insurance and there is a lack of clarity about the extent to which the government compensates injured parties in the event of physical housing damage due to climate. Lack of knowledge about the potentially large financial deductibility in the case of climate-related housing damage may explain why homebuyers now rarely price physical climate risks.

Climate-related damage to homes is not always insurable and – at least in the Netherlands – there are clear differences between insurers' policy terms in this regard. For example, damage caused by flooding of major rivers or by the sea entering the country (via a breach of primary flood defences) is not insurable in the Netherlands. Also, the financial compensation offered by the government is not a given by law. Through the so-called Disaster Damage Compensation Act, the government can financially compensate victims in case of large-scale damage caused by a disaster that is not insurable. But both the amount of the compensation and the cases that qualify are not predetermined.

### 3 Role of physical climate risks on housing prices may increase rapidly

Although the role of physical climate risks in the housing market is still small, this could suddenly change, causing a downward house price shock. Concerns about physical climate risks may for example quickly increase after one or few incidents with severe physical damage to housing. In addition, stricter reporting requirements around climate risks will force companies to improve their data and methodology for estimating these risks (this will then lower the search and information costs). Furthermore, it is to be expected that insurers and the government will be increasingly explicit about the extent to which they cover the financial losses of physical climate risks.

Concerns about physical climate risks can grow rapidly

Concerns about the physical impacts of climate change can grow rapidly. Firstly, extreme weather conditions and the associated damage to homes are expected to increase, making the physical consequences of climate change more visible in the long term. The erratic nature of sentiment implies that concern about physical climate risks can suddenly increase after one or few climate incidents take place.

Secondly, local authorities and market parties such as insurers and financial institutions all have an incentive to increase the awareness of households and professional parties about physical climate risks (on the housing market). These parties are expected to put more effort into communicating to clients and citizens about the potential impact of climate risks on homes and strategies to prevent or reduce damage.

Search and information costs will decrease

The market can price in physical climate risks more easily once information about these risks becomes more readily available. Home buyers will then directly factor these risks into their purchase decisions, or this may happen indirectly, for example if financial institutions start to explicitly consider these risks when evaluating financing applications. Several trends will help lower search and information costs of estimating physical climate risks over time.

For example, the European Central Bank is expected to increase its requirements for banks, pension institutions and insurers with regard to their climate risk management, because it sees climate change as an important risk to financial stability. Currently, the ECB requires banks to gain insight into the climate and environmental risks of their portfolio. Stricter regulation will force data on physical climate risks to become increasingly available.

The expected improvements in the quantity and quality of climate data will also help to improve the estimation of physical climate risks. In addition, a standard methodology to estimate climate risks is likely to become available in the nearby future. In the Netherlands, the Framework for

Climate Adaptive Buildings is currently developing a standard of physical climate risks of buildings.

Insurers and government benefit from clarity on financial deductibles

Over time, businesses and households are expected to be more aware of the financial deductibility they face from physical climate risks. This is partly because insurers and the government will be more explicit about the extent to which they cover the financial consequences of physical climate risks.

The incentives of insurers to inform (private and professional) homeowners about physical climate risks are two-fold. First, it encourages households and businesses to take preventive measures that help to reduce future physical climate damage and keep the claims burden manageable. Second, it helps manage reputational risk by reducing the likelihood of disappointment and anger among policyholders afterwards.

Governments too have an incentive to be transparent on the conditions and extent they compensate households and businesses in case of climate incidents beforehand. Firstly, uncertainty about these conditions hinders insurers from developing new products to cover these risks (citizens and businesses tend to count on government compensation in that case, lowering their willingness to insure themselves against climate risks). Secondly, it helps to prevent disappointment and misunderstanding among victims of climate events who do not receive compensation against their expectations.

## Major uncertainties about price effect and timing

How large the effect on prices will be, as well as the timing of the price effect, cannot be predicted in advance. This depends, among other things, on the extent of climate change and future policies. If for example, governments impose stricter requirements on financial institutions around reporting and managing physical climate risks, or introduce a mandatory "climate label", this will accelerate the pace at which the market prices in physical climate risks in the housing market.

Moreover, physical climate risks – and therefore the effect on house prices – will vary by region and property. This is not only because of regional climate differences but also because of the adaptation measures homeowners and governments can take to increase the climate resilience of homes. Taking timely adaptation measures helps mitigate physical climate risks.

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