Marketing Material

Environmental Risk and Real Estate

Where in Europe does environmental hazard pose the greatest risk to real estate?

IN A NUTSHELL

_ Climate change is a growing threat to real estate returns across Europe.

_ The risk to real estate values in Europe is highest from flooding due to sea level rise and extreme weather events.

_ Assets or sectors which rely on reliable and plentiful power or water sources are most likely to need to adapt to cope with changing climate.

1.1 Introduction

The meaning of risk in real estate is changing. The number of extreme weather events increased by over 250% between 1980 and 2013 globally,[1] and insured losses in 2020 as a result of weather-related events were the fourth highest on record.[2] Classic measures such as expected vacancy, standard deviation of returns, and rental growth, while still highly relevant, are no longer sufficient to take account of the growing set of physical and regulatory hazards which are coming in to play as a result of climate change.

To better understand the vulnerability of locations and assets to these risks, we have used the Physical Climate Risk Tool available through Measurabl. Measurabl is the most widely adopted ESG software for commercial real estate, and is integrated with Four Twenty Seven, a leading publisher of data and analysis relating to physical climate and environmental risks. The Risk Tool scores individual DWS assets according to exposure to the following physical risks which have important consequences for business continuity:

_ Heat stress (increase in temperature)
_ Water Stress (change in water supply and demand)
_ Earthquakes
_ Floods (change in rainfall conditions and size and frequency of possible floods)
_ Hurricanes and Typhoons (exposure to past cyclones)
_ Sea level rise (heightened storm surge, exacerbated by sea level rise)

The data takes into account likely changes in risk in the period 2020-2040 based off projections of future climate trends.

[1] Topics Geo 2013, Munich Re, 2014
[2] SwissRe, December 2020

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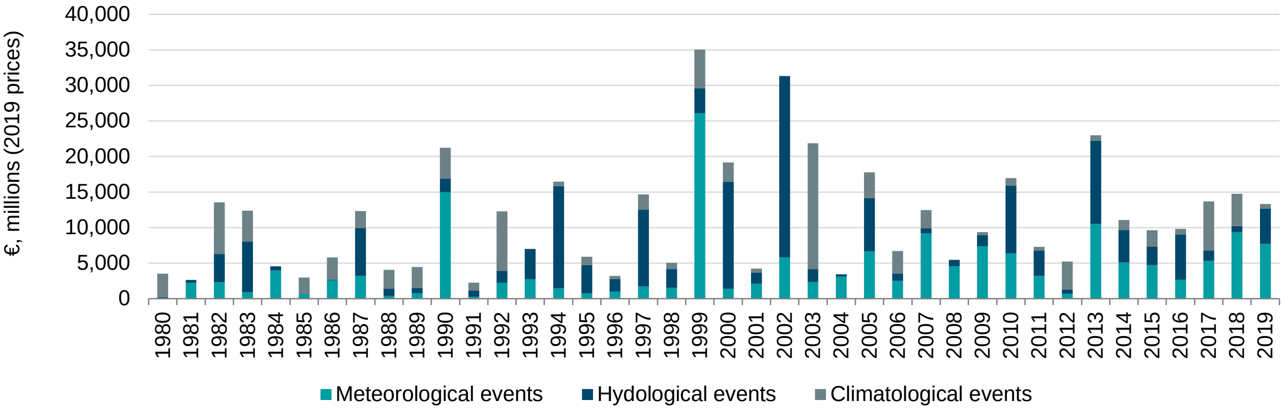
ECONOMIC DAMAGE CAUSED BY WEATHER AND CLIMATE-RELATED EXTREME EVENTS IN EUROPE (1980-2019)



Source: MunichRe, as of 12/20

1.2 Which locations are at risk?

If asked which European countries are most at risk from climate change, most would point towards the warmer countries of Southern Europe. Indeed, these countries are expected to be most at risk from heat and water stress as temperatures rise.

Real estate values, however, are not particularly sensitive to heat and water stress except at extreme levels. None of the Southern European countries fall into a 'high' or 'extreme' level of risk according to the Measurabl data. Increasing temperatures do not tend to directly harm a building, but diminish value indirectly through increasing building running costs and the risk of power outages, or reducing the attractiveness of a locality as a place to live and work due to extreme temperatures.

Sectors such as hotels where running costs are higher, or logistics where a steady power supply is important, are more sensitive to heat and water stress as there is a greater impact on operators' bottom lines. Studies in the U.S. have already shown a likely erosion in hotel profit margins due to higher average temperatures.[3] There are also differences within these sectors. An industrial asset relating to the manufacture of denim, for example, will rely on a plentiful supply of water much more than a warehouse storing dry goods.

For most European countries, the greatest direct environmental risk to real estate stems from not having too little water, but too much. Flooding due to sea level rise and overflowing rivers can cause severe damage to property and infrastructure, as well as slower future price appreciation.[4] Insurance has been the main tool for mitigating these risks, but if flood events increase in frequency or severity, certain assets may become uninsurable, causing permanent loss of value. For example in the UK, an estimated 70,000 homes are at risk of becoming uninsurable due to flood risk.[5]

Insurance also does not take into account future loss of value at disposition or reversion. This is increasingly concerning given the rising probability of flooding from both higher frequencies of extreme rainfall as well as sea level rise. Insurers clearly see climate change trends as a risk to value.

A 2019 study by Deloitte found that over half of U.S. insurance regulators saw climate change as likely to have a high or extremely high impact on underwriting assumptions and coverage availability.[6]

[3] Loss of profit in the hotel industry of the United States due to climate change, He et al., 2019

[4] Where, When, and How Do Sophisticated Investors Respond to Flood Risk?, Eichholtz et al. (Working Paper, 2019)

[5] High and dry: Preventing tomorrow's 'flood ghettos', Bright Blue, February 2020.

[6] Insurance Regulator State of Climate Risks Survey, Deloitte Center for Financial Services, 2019.

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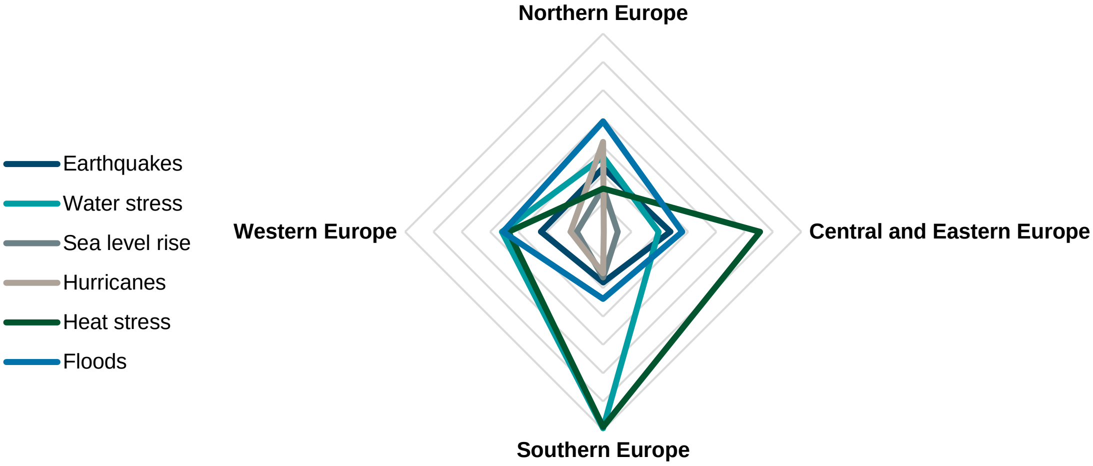
The countries at greatest risk from flooding are mainly in Northern Europe. Our analysis identified parts of the Netherlands, the United Kingdom, Ireland, Northern Germany, and Poland as at high risk, while cities in Spain tended to be at the lowest risk from flooding.

Importantly though, when looking at the asset level, there were many exceptions to these general trends, as flooding tends to be highly localised depending on specifics of topography and local weather patterns.

Some low-lying locations are at greater risk of river flooding due to sea level rise. Hamburg, for example, despite being over 100km from the sea regularly experiences flooding as storm surges push water up the river Elbe, raising water levels and flooding the historic centre.[7] As sea levels rise, flooding due to storm surges are likely to become more regular. Other areas at direct risk from sea level rise over the next 20 years include parts of Dublin, Barcelona, South Holland, and Northern Germany.

What remains to be seen is how localities will adapt to a changing landscape of risks. In many key European markets, response plans are already in place, or are being developing. These are likely to reduce the risk posed to real estate from environmental hazards, in particular flooding which can be more locally or regionally addressed. Understanding these mitigation plans will be the key next step in moving to an assessment of real estate resilience, not only vulnerability, to environmental hazard.

ENVIRONMENTAL RISKS BY SUB-REGION, RANK OF SCORE AVERAGED BY SUB-REGION



Source: Measurabl, Four Twenty Seven as of 4/8/21

Relative to other continents, Europe generally has low exposure to natural disasters such as earthquakes and hurricanes. There are a handful of exceptions. Parts of Italy such as Rome and Bologna are earthquake-prone, as well as the area of Lisbon in Portugal.

Building codes can also mitigate the risk which, compared to climate change, is unlikely to become more severe over a 20-year timescale. Hurricanes pose a very limited threat in Europe, especially compared to APAC and the Americas, although parts of England and Ireland are at some risk of storm-force winds.

[7] Hamburg's Half-Billion Dollar Bet, Hakai Mazagine, May 2017

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1.3 Conclusion

This analysis reinforces our conviction that climate change is a significant challenge for all parts of the real estate market, and an important consideration when determining strategy.

The strategic implications are that in the absence of any mitigation strategies, climate risk premiums may be higher in Northern than Southern Europe. This is due to the serious and direct nature of the risks posed by flooding and sea level rise to real estate. Southern Europe may struggle with rising temperatures and falling access to water, but these risks are less of a direct threat to real estate values.

It is important to consider that different sectors are affected to different degrees by physical and environmental change. Resource-intensive sectors such as hotels are most likely to need to adapt to a reduction in water availability or a rise in temperatures. Logistics facilities which require a constant and reliable source of power might also need to develop strategies to cope with brown-outs if a rise in temperatures puts additional strain on power supplies due to the demands of air cooling systems.

DWS's track-record in focusing on physical climate risk

Physical climate impacts are materialising across major asset classes but cannot be managed exclusively on an asset by asset basis. Investors need to manage risks across asset classes and also engage more widely with local stakeholders to improve resilience and adapt to climate impacts to the best extent possible. For the past several years, DWS has undertaken to influence the discussion around real estate and climate change in a variety of ways:

_ In 2017, DWS became perhaps the first major asset manager to commission a report analysing the impact of physical climate risks on equity portfolios.[8]

_ In 2018, we were invited to chair a working group that developed recommendations for how companies should disclose physical climate risks.[9]

_ Also in 2018, a DWS real estate expert published "a practitioner's perspective on physical climate risk".[10]

_ DWS was the only asset manager invited to provide input to a UNEP FI report for the Global Commission on Adaptation, to understand how policies can accelerate the flow of capital into adaptation activities.[11]

_ We were invited to contribute to S&P Global Trucost's development of physical climate risk data and provided our investor perspective in a whitepaper explaining the new dataset.[12]

_ DWS became a founding member of the Coalition for Climate Resilient Investments (CCRI), which was announced at the UN Climate Summit in 2019. CCRI aims to integrate physical climate risk into infrastructure cash flow analysis.[13]

_ During 2021, DWS is playing a prominent role in contributing to the development of investor expectations for companies on physical climate risk through the Institutional Investors Group on Climate Change.[14] DWS's Research Institute will publish an accompanying report which will also consider the social justice implications of physical climate impacts.

[8] DWS and Four Twenty Seven, 2017.

[9] European Bank for Reconstruction and Development (EBRD) and Global Center on Adaptation (GCA), May 2018 www.physicalclimaterisk.com

[10] DWS September 2018 dws.com/globalassets/institutional/research/pdfs/physical_climate_risk_Sep_2018.pdf

[11] UNEP FI July 2019 www.unepfi.org/climate-change/adaptation/gca-adaptation-finance-background-paper/

[12] S&P Global Trucost 2019 "Understanding climate risk at the asset level" www.trucost.com/publication/understanding-climate-risk-at-the-asset-level-the-interplay-of-transition-and-physical-risks/

[13] CCRI 2019 resilientinvestment.org/

[14] IIGCC forthcoming 2021 and DWS forthcoming 2021

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_ Adverse changes in law and regulation including environmental laws and regulations, zoning laws and other governmental rules and fiscal policies;
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