

# Physical climate change risks—Highlights and implications for the insurance sector

Nicole Kappelhof  
Maarten Ruijsaard



On 20 May 2022 the European Insurance and Occupational Pensions Authority (EIOPA) published a discussion paper on the materiality of the European insurance sector exposure to physical climate change risk. The report investigates property, content, and business interruption insurance against windstorm, wildfire, river flood, and coastal flood risks. In this paper we highlight the most important results.

## Introduction

In its discussion paper EIOPA presents the first results of its physical climate risk study that focuses on insurance of property, content, and business interruption against mainly windstorm, wildfire, river flood, and coastal flood risk. EIOPA collected data from 44 large European groups and solo undertakings active in non-life business with relevant exposure to the fire and other damages to property lines of business.

To support its analysis, three major European natural catastrophes are examined: the windstorm Ciara in central Europe 2020, the forest fire in Portugal in 2017, and the flood in Czechia, Germany, Switzerland, Hungary, and Austria in 2013. Additionally, insurance data for year-end 2020 was collected, together with insurer's views and expectations for the next 10-20 years regarding potential impact of physical risks on their business strategies.

The report focuses on assessing the materiality of the insurance sector exposure to physical climate risks and aims at contributing to the climate risk discussion by providing new key insights.

## Climate change and physical risks

Physical climate change risk can be divided into acute (increase of extreme weather events) and chronic (gradual climate change) impacts. EIOPA discusses three factors that an insurer can take into consideration when assessing these risks: (1) the level of exposure (such as the potential share and composition of the population or the value and properties of assets at risk), (2) the hazard describing the physical characteristics (such as intensity and frequency of weather-related events), and (3), the vulnerability of the exposure to the risk (such as destruction rates or damage ratios).

An increase in any of these three factors may necessitate changes in premiums, terms, and conditions of (re-) insurance treaties. This can substantially impact insurability and affordability of coverages, thereby widening the insurance protection gap.<sup>1</sup> EIOPA depicts this gap in its protection gap dashboard, and is monitoring potential trends to further develop the dashboard.

Insurers may be able to reduce the protection gap and limit societal impact caused by climate change by introducing or innovating products, including and promoting adaption measures (such as storm-resilient property), and sharing information to raise public awareness to climate change risks and possible ways to address them.

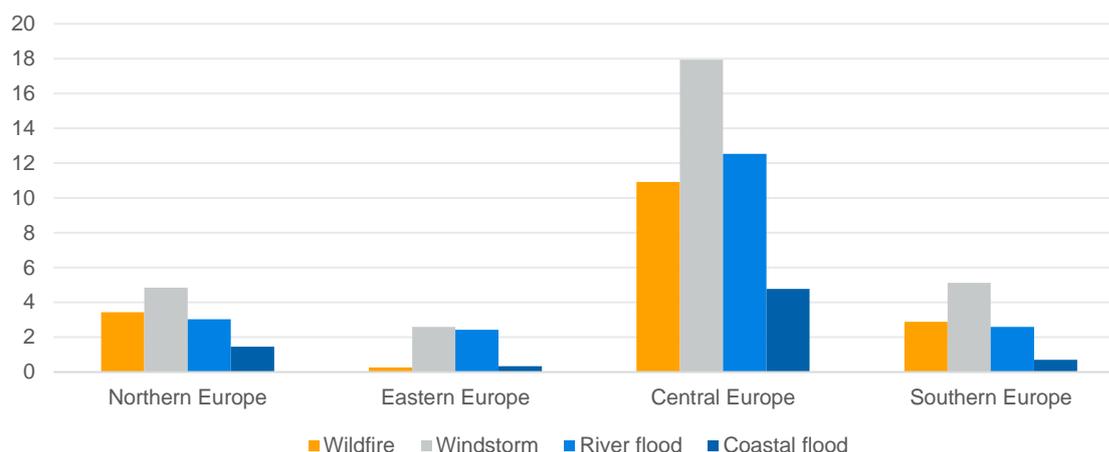
---

<sup>1</sup> The difference between the level of insurance coverage (measured by insured losses) and the amount of economic losses caused by natural catastrophes

## Current coverage in sample

The collected sample covers all 30 European Economic Area (EEA) jurisdictions and encompasses approximately 59% of the 2020 direct business gross premiums for the line of business “*fire and other damages to property*” in the EEA-wide market. In the sample, the total sum insured for building, content, and business interruption is highest for windstorm risk (EUR 42.6 trillion), followed by river flood (EUR 28.9 trillion), wildfire (EUR 22.8 trillion), and coastal flood (EUR 9.1 trillion). The distribution across regions and risks is shown in Figure 1.

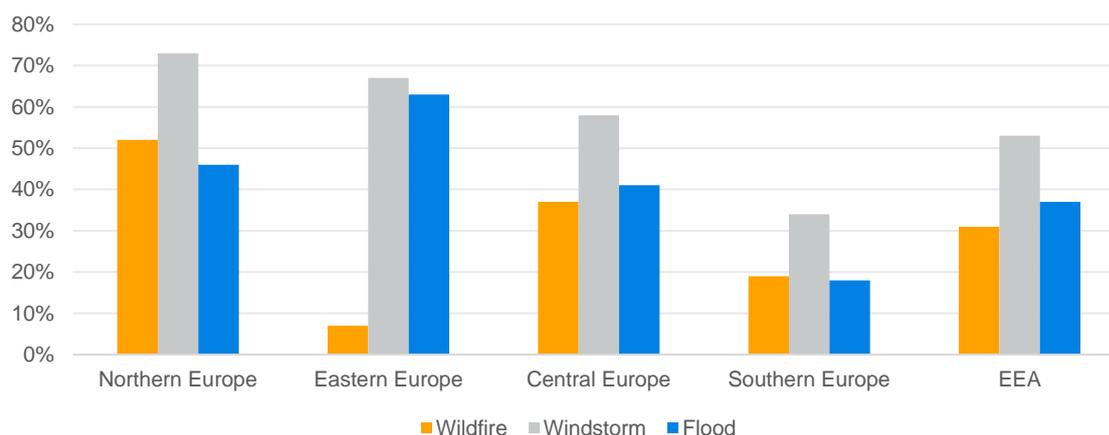
**FIGURE 1: SUM INSURED FOR BUILDINGS BY REGION AND PERIL, IN EUR TRILLION.**



Source: EIOPA. Reference date: 2020, as cited in Figure 5 of EIOPA – Discussion paper on physical climate change risk.

However, due to substantial variation in market prices of properties, differences in insured values across European regions might not be directly representative of market penetration. Figure 2 shows the value of insured buildings in relation to the total value of buildings in the region, yielding a representation insensitive to market prices.<sup>2</sup>

**FIGURE 2: PERCENTAGE OF VALUE OF INSURED BUILDINGS TO TOTAL VALUE OF BUILDINGS, BY REGION AND PERIL, IN THE SELECTED SAMPLE.**



Source: EIOPA, EFEHR Risk Maps data, LitPop. Reference date: 2020, as cited in Figure 8 of EIOPA – Discussion paper on physical climate change risk.

<sup>2</sup> Distortion can still exist due to, among others, countries with national systems or semi-voluntary schemes.

The breakdown of the four investigated risks by region shows that windstorm is the most insured risk. Windstorm is also the most damaging event in Europe: analysis by PERILS<sup>3</sup> shows that windstorm risk accounted for an average annual insured losses of 2.6 billion for European insurers (not limited to the sample) or 0,0048% of insured values. However, yearly impact may vary significantly across insurers due to geographical concentration of claims. River floods, for which more than half of the insured properties are located in France and Germany, has the second highest total sum insured across the sample. The third most insured risk, wildfire, is covered predominantly by the German market, with over 30% of the overall sum insured in the EEA. This is partly due to the market values of the property sector and the extensively distributed fire insurance policy covering wildfire risk. Lastly, properties insured for coastal floods are predominantly located in France, with an exposure of more than 50% of overall insured value at EEA level.

Insurance companies have exposure to both residential and commercial properties. Significant differences between residential and commercial business exist in the total number of contracts, sum insured per building, and exposure to content-related losses. Consequently, natural catastrophes in highly industrial and insured areas could significantly impact the insurance sector.

## Current premium in sample

Insurance against extreme climate events generate gross written premiums of EUR 19.3 billion at the EEA level. In the sample, this accounts for 9% of the non-life business, and results in a cost for homeowners of less than 90 euros per property each year. Cheapest coverage is found in Eastern Europe, and the most expensive is in Central Europe. Coverage is overall often relatively limited: only 35% of the total losses by extreme weather and climate-related events in Europe are insured. Additionally, 19% of the collected gross written premium is used for reinsurance coverage, with ceded premium being higher for commercial properties than for residential properties. Wildfire risk is the most reinsured risk (34% for commercial contracts and 21% for residential), followed by river flood (23%), coastal flood (23% for commercial and 14% for residential), and windstorm risk (19% for commercial and 15% for residential).

## Standard formula SCR in sample

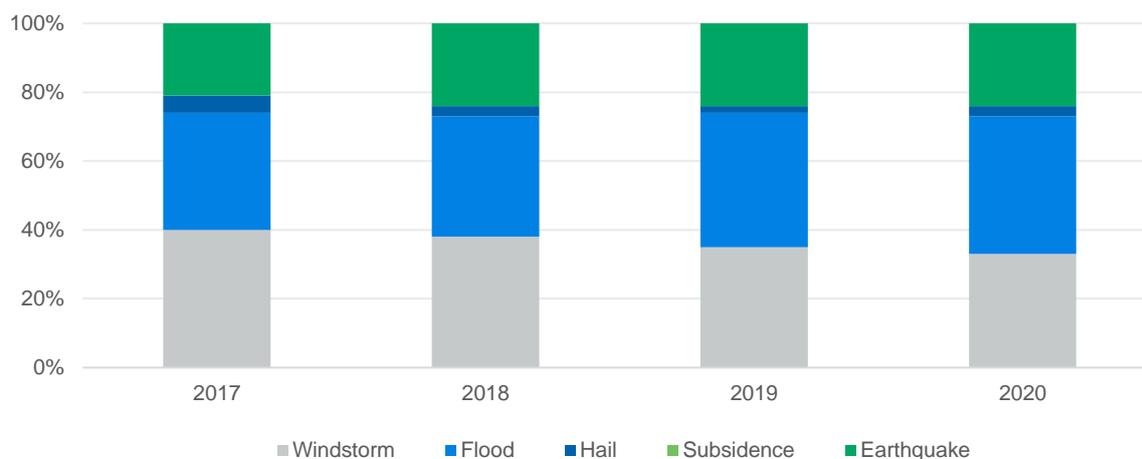
The natural catastrophe risk module in the standard formula for SCR calculation covers earthquake, windstorm, flood, hail, and subsidence risk. Windstorm risk is included in country charges for 19 EEA countries, as well as UK and CH and is thus the most widely applied peril, followed by earthquake risk and flood risk. Wildfire risk is not included in the natural catastrophe risk module.

As of 2020, for all undertakings in the sample using standard formula (44%), the exposure to windstorm is the most significant at around 46% of total exposures. The second largest risk is flood, followed by earthquake, hail and subsidence. Exposures to windstorm risk are mainly concentrated in Germany, France, and Norway (53% of total standard formula exposures to windstorm), and exposure to flood risk are mainly concentrated in France, Germany, and Poland (76%).

Regarding the diversified risk charges, shown in Figure 3, flood was the most significant peril in 2020, accounting for 44% of the total natural catastrophe risk charge. Second was windstorm (30%), followed by hail and subsidence with an aggregate of 2%. Subsidence is the smallest risk, since it is only included in the standard formula of France.

<sup>3</sup> PERILS, (2018 June). PERILS Inside N°1/2018 Retrieved from: <https://www.perils.org/files/News/2018/Newsletters/PERILS-Newsletter-1-2018.pdf>, as cited in EIOPA – Discussion paper on physical climate change risk.

**FIGURE 3: SCR STANDARD FORMULA NATURAL CATASTROPHE RISK MODULE CHARGES AFTER DIVERSIFICATION AND RISK MITIGATION BY PERILS, AS PERCENTAGE OF NATURAL CATASTROPHE RISK CHARGE.**



Source: EIOPA, *Annual Solo*. Reference date: 2020, as cited in *Figure 2.B of EIOPA – Discussion paper on physical climate change risk*.

## Historical claims

Inspecting the claims of 2020 in the sample shows that windstorm claims are most frequent, accounting for almost 70% of the total. River flood claims are the second most frequent, at 23%, followed by wildfire (6%) and coastal flood (1%). Damages to buildings account for more than 90% of the overall residential losses (buildings and content). A similar pattern is visible for commercial losses. Over 80% of losses caused by windstorm and flood concern damages to buildings, 15% to content, and the remaining 5% to business interruption. Wildfires caused less damage to buildings, amounting to 60% of the total, with losses for content and business interruption being 25% and 15%, respectively.

In 2020, Central and Southern European countries were the most impacted by natural disasters. This was caused by high windstorm and wildfire losses. Commercial losses due to extratropical storms accounted for 22% of commercial losses in Southern Europe in particular, and wildfire losses accounted for another 6%. At European level, the highest damage occurred in Central European countries due to the exceptionally severe summer floods. The event is considered the costliest natural disaster both in Germany and at the European level. Estimated losses of around EUR 33 billion in Germany accounted for two-thirds of the total damages, of which 25% was insured.

The executed case studies (windstorm 2020 in central Europe, forest fire 2017 in Portugal, and flood 2013 in Czechia, Germany, Switzerland, Hungary, and Austria) point to generally manageable losses for the undertakings in the sample, but also show that a single natural catastrophe can cause significant impact on annual claims structure. Additionally, reinsurance demonstrated significant importance, especially for the claims relating to the windstorm Ciara.

## Future trend

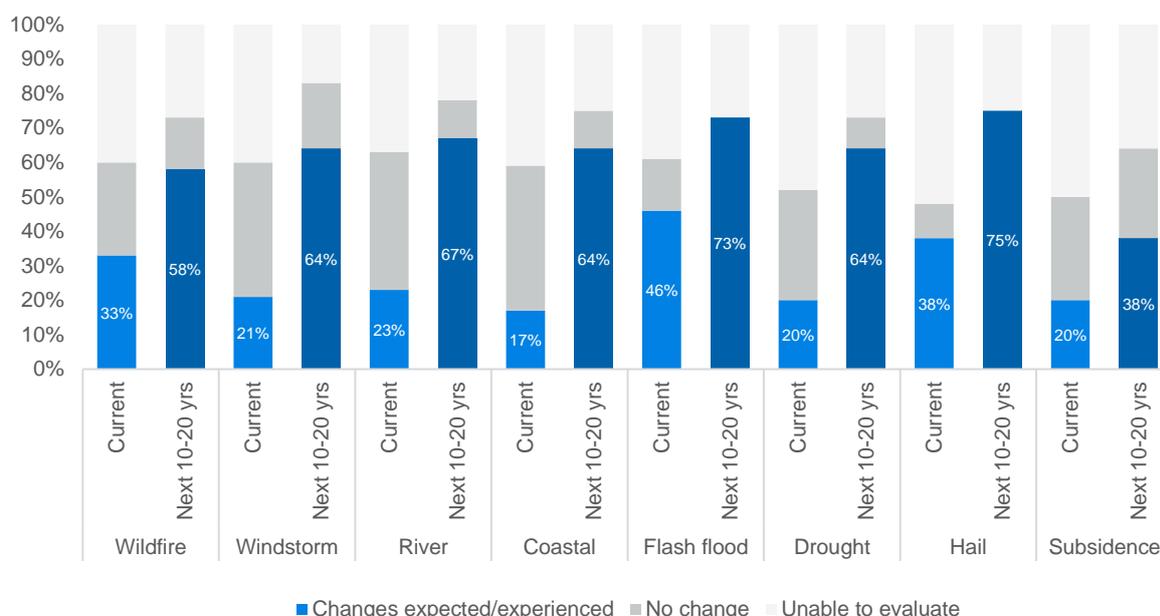
Climate change is exacerbating the frequency and severity of weather related events. Globally, weather-related events have been responsible for an increasing trend in both total economic losses and insured losses in the last decades. Inspecting historic European events, the Intergovernmental Panel on Climate Change (IPCC) report<sup>4</sup> reveals different trends depending on the season and region considered. An increase in flooding was detected in North, West, and Central Europe. Southern European countries experienced an increasing trend in wildfire, and Mediterranean countries saw an increase in droughts, both agricultural and ecological. Severe windstorms are predicted to increase across all European regions. Additionally, participants indicated they expect an increase in the frequency of river floods for most European regions and of wildfire for the Southern European regions.

<sup>4</sup> IPCC, (2021), Sixth Assessment report. Retrieved from: <https://www.ipcc.ch/report/ar6/wg1/#Regional>, as cited in *EIOPA – Discussion paper on physical climate change risk*.

Consensus is growing that premium increases are likely and adaptation and mitigation measures are necessary to reduce future risk, but uncertainty around future climate change projections may lead to mispricing and under-reserving. Among others, areas previously considered low or no risk might cause significant future losses, such as wildfire, drought, and the potential resulting subsidence.

Participants in the study expect that climate change will affect the property line of business most. Figure 4 shows the sample’s observed and expected climate change impacts per peril.

**FIGURE 4: OBSERVED AND EXPECTED CLIMATE CHANGE IMPACTS THE AT GLOBAL LEVEL, BY PERIL AND IN PERCENTAGE OF POSITIVE ANSWERS IN SAMPLE**



Source: EIOPA. Reference date: 2020, as cited in Figure 25 of EIOPA – Discussion paper on physical climate change risk.

Substantial impacts are foreseen on agriculture, forestry insurance, fire, and other damage to property and business interruption due to an expected increase in frequency and impact of wildfire risk. Windstorm risk is expected to impact all property-related lines of business, in particular property, forestry, infrastructure, motor, and transport. The increase in exposure is one of the main drivers of the growing disaster losses, which is in itself driven by higher property values, economic growth, and population dynamics such as migration to more risk-prone areas (such as coastal).

Reacting to the observed trend and future expectations, insurance companies are already closely monitoring (or planning to monitor) the potential evolution of windstorm, river flood, and wildfire. Premiums have already been increased in multiple countries (especially for windstorm risk). Additionally, for river floods and to a lesser extent windstorm risk, multiple risk-mitigating measures have been implemented or are to be implemented, such as modification of risk selection process, changes to re-insurance agreements, raising awareness and/or incentivizing mitigation policies, lowering limits, and applying higher deductibles or policy restrictions. Some of these measures, possibly paired with an increase in unemployment and poverty caused by more frequent business disruptions, may constrain demand for insurance coverage. Unavailability of insurance protection at an affordable price may lead to reputational risks and have broader macroeconomic implications.

Due to, among others, uncertainty about (the effect of) implementation of risk-mitigating measures, projected climate change trends cannot be directly translated into insurance effects. Standardized methods to assess climate change risks are not widely and fully developed. Additionally, we have observed that climate related events might cause governments to consider introducing compulsory insurance schemes. Complexity and uncertainty in terms of time horizons and potential future pathway and developments make it difficult to precisely assess future climate change risks and exposures. More than half of the participants in the sample had not undertaken climate change analyses yet, indicating that (especially smaller) insurers still need expand their expertise.

## Next Steps

Going forward, EIOPA will continue to push the sustainable finance agenda, and bring new analysis, results, and policy proposals to help prepare the insurance sector for the effects of climate change and support further forward-looking views and analysis of physical risks in light of climate change.



Milliman is among the world's largest providers of actuarial and related products and services. The firm has consulting practices in life insurance and financial services, property & casualty insurance, healthcare, and employee benefits. Founded in 1947, Milliman is an independent firm with offices in major cities around the globe.

[milliman.com](https://www.milliman.com)

### CONTACT

Nicole Kappelhof  
[nicole.kappelhof@milliman.com](mailto:nicole.kappelhof@milliman.com)

Maarten Ruisaard  
[maarten.ruisaard@milliman.com](mailto:maarten.ruisaard@milliman.com)

© 2022 Milliman, Inc. All Rights Reserved. The materials in this document represent the opinion of the authors and are not representative of the views of Milliman, Inc. Milliman does not certify the information, nor does it guarantee the accuracy and completeness of such information. Use of such information is voluntary and should not be relied upon unless an independent review of its accuracy and completeness has been performed. Materials may not be reproduced without the express consent of Milliman.