ANALYSIS

# Increased flood risks caused by climate change will also affect banks

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Due to climate change, extreme weather events will become more frequent, resulting in material damage to buildings and other infrastructure. In Finland, for example, this will probably increase the risk of coastal floods. Many of the properties used as loan guarantees are located in coastal areas, meaning collateral worth hundreds of millions of euros will probably be exposed to coastal flood risks. The problem will also be exacerbated in the future by the shift of population and economic activity from the interior regions to coastal areas.


Climate change is increasing the frequency of extreme weather phenomena. This will impact particularly on insurance companies through rising liabilities. Besides insurance companies, extreme natural events also affect banks. Bank loans are often secured by real estate, which may be located in flood risk areas. If a catastrophic weather event destroys or significantly damages property, the collateral of the loan ceases to exist. If the property has not been insured or if the insurance does not cover flood damage in its entirety and the debtor is unable to repay the loan, the bank's loan losses will increase. Extreme weather events may therefore result in major losses for banks, which will create new kinds of risks to collateralised loans and may change policies related to lending or loan collateral. This, in turn, could result in banks not granting credit to purchases of housing that is otherwise attractive.

In addition to housing, business activities are also increasingly concentrated in coastal areas. For businesses, flood damage may have more far-reaching effects, as in addition to direct damage, floods also cause financial losses by indirectly suspending operations if the businesses' inventories, workspaces or equipment are damaged in the flood. Major floods can also halt transport if coastal roads, railways or ports are damaged in the flood. This is likely to increase the credit losses arising from corporate loans as debtors' income runs out, even if there is only limited material damage.

As a rule, flood risks are not yet adequately priced in the real estate market, especially in areas where flooding has been rather rare. Studies show that realised flood damage will severely reduce the prices of properties vulnerable to floods, but the impact of floods on the overall price of real estate in the area will generally fade in a few years.[1] However, if the frequency of floods increases, for example due to climate change, the market will no longer have time to forget about flood

damage, leading to permanently reduced prices. The collateral value of an expensive and debt-funded property will decline permanently when it turns out that it is located in a high-risk area, which leaves the loan without sufficient collateral. Insurance often compensates for material damage, but it does not compensate for the loss of market value.

## Climate change increases the risk of coastal floods in Finland

One of the most evident consequences of the worsening of climate change in Finland in the coming decades will be an increase in coastal floods.[2] There are already seven significant coastal flood risk areas in Finland.[3] In addition to coastal floods, floods caused by excess rainwater and meltwater runoff will become more common, as climate change is expected to increase the amount of rain in Finland. The impact on river and lake flooding, on the other hand, will be much smaller.[4]

According to a report by the Finnish Environment Institute (SYKE), coastal flood damage can be expected to become more common in Finland as a result of climate change, mainly from the 2050s onward. Economic losses caused by floods are also expected to increase in the future, as housing and the economy are increasingly concentrated in coastal areas in Finland. According to a report published by the Meteorological Institute, sea levels in Helsinki, for example, may rise by almost one metre by 2100, even if land uplift slows the change.[5] The rising sea level will naturally increase the risk of flooding for coastal properties, which is why it is already taken into account in land-use planning and in the selection of construction sites. However, this only applies to new construction – in the old building stock, rising sea levels have often not been considered.

## Only a small part of Finnish credit institutions' housing loan collateral is located in coastal flood risk areas

There are no separate statistics for the coastal flood risks of banks' housing loan collateral in Finland. However, it is possible to estimate the magnitude of the problem by combining data from different sources. The illustrative calculation presented in this article was carried out for each city located on the Finnish coast with over 50,000 inhabitants in December 2017. The calculation is based on a combination of data from different sources.

The total area of dwellings currently located in high-risk coastal flood areas, broken down by type of house, has been obtained from data provided by the Finnish Environment Agency for each coastal city. All buildings, the centre of which, under current conditions[6], will be flooded at least once every thousand years, have been included in the risk area. The average amount of

households' housing loan per square metre has been calculated using Statistics Finland's service set of income distribution data[7]. The average housing loan (EUR/$m^2$) in each municipality and for each type of house has been multiplied by the floor-area of the dwellings located in the flood risk area. The figures are presented in Table 1.[8]

| | Apartment buildings | Terraced and semi-detached houses | Detached houses | Total | Share of housing loans in the city |
|---|---|---|---|---|---|
| Helsinki | 49.0 | 13.4 | 15.4 | 77.8 | 0.5% |
| Espoo | 18.3 | 6.6 | 11.5 | 36.4 | 0.5% |
| Turku | 0.1 | 1.3 | 0.8 | 2.2 | 0.1% |
| Oulu | 0.8 | 0.8 | 8.0 | 9.6 | 1.3% |
| Vaasa | 0.2 | 0.6 | 1.1 | 1.9 | 0.3% |
| Pori | 5.5 | 44.7 | 34.9 | 85.1 | 3.7% |
| Kotka | 0.0 | 2.9 | 11.1 | 14.0 | 2.6% |
| Porvoo | 4.4 | 1.8 | 12.1 | 18.3 | 1.4% |
| **Total** | **78.3** | **72.1** | **94.9** | **245.3** | **0.8%** |

Housing located in flood risk areas probably serve as collateral for housing loans totalling approximately EUR 150–350 million in these eight cities.[9] The loan customer is responsible for the entire loan even if the property has become permanently uninhabitable. In many cases, insurance would compensate the debtors for the damage. On the other hand, the calculations do not include any other loans that the house may serve as collateral for. In addition, the flood risk assessment does not take into account basements levels or possible drainage water damage.

There are also many other uncertainties and simplifying assumptions associated with the calculation. Loans for purchasing housing located in flood risk areas may not be the same size as loans for purchasing housing farther from the shore. Properties located on the seashore are usually more expensive than inland properties, thus potentially requiring larger loans. On the

other hand, the flood risk in the location may already have limited the amount of loans banks are willing to lend for the property. Rental housing in low-lying coastal areas may be less common or more common than elsewhere, so the share of households with a housing loan may be completely different than in the city on average. Many coastal cities are growing, which may increase the financial risk in the future. However, even in coastal cities, more than 99% of all housing loans have been granted for properties that would be safe even during an extreme coastal flood.[10]

## The coastal flood risks of Finnish credit institutions' commercial real estate collateral are concentrated in certain postcode areas

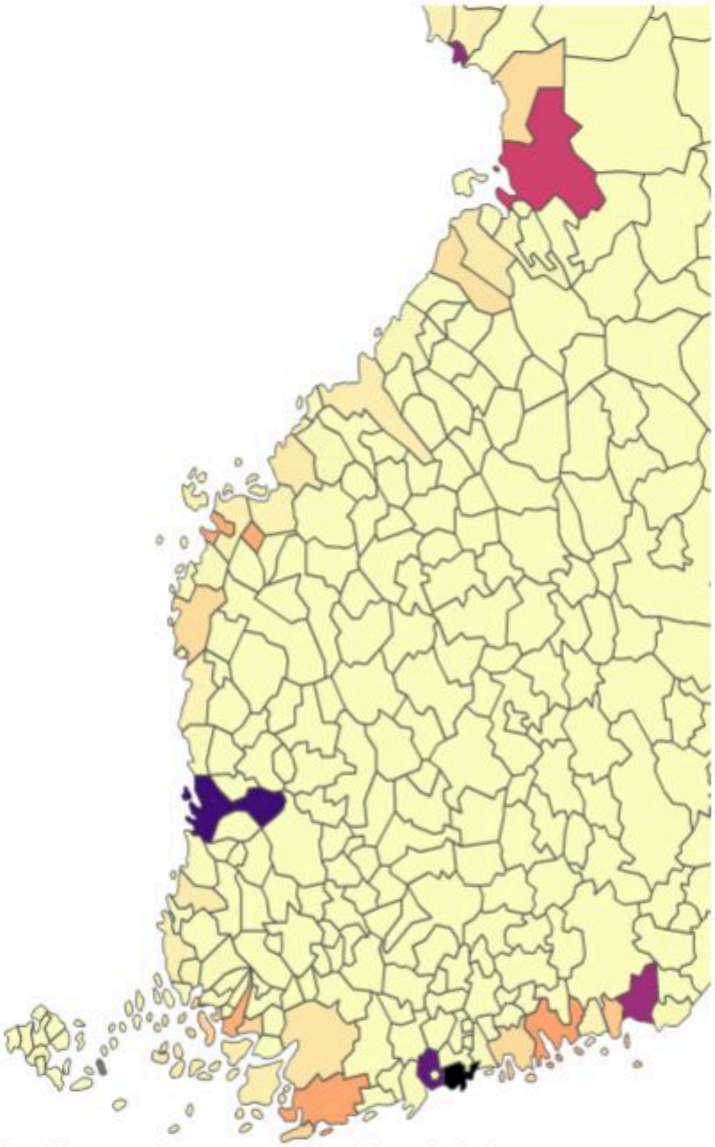
More than 400 postcode areas are affected by potential coastal floods. Based on data provided by the Bank of Finland, the Finnish Environment Institute (SYKE) and Statistics Finland, it is possible to estimate the number of commercial properties by postcode area and calculate banks' potential losses from flood damage to commercial real estate collateral.

Real estate data are divided by type of property and postcode. At the end of 2019, commercial real estate collateral located in postcode areas with a risk of coastal floods[11] in the largest cities amounted to nearly EUR 22 billion. The real coastal flood risk of the collateral is estimated by calculating the share of properties in the postcode area located in the coastal flood risk area as calculated by SYKE.[12] According to the estimate, credit institutions' commercial real estate collateral accounts for less than one per cent of all commercial real estate collateral located in coastal flood risk areas, with the exception of certain areas of Pori.[13]

Chart 1.

# Banks’ commercial real estate collateral located in costal flood risk areas

**Commercial real estate collateral by municipality**



Value of collateral located in flood risk areas, EUR million

0 10 20 30

Sources: Statistics Finland, Finnish Environment Institute (SYKE) and by the Bank of Finland.

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Although only a small part of commercial real estate collateral is associated with a coastal flood risk, the risks still affect collateral amounting to more than EUR 100 million. Chart 1 shows that coastal flood risks are mainly concentrated in a few large cities. Risks to commercial real estate collateral and housing loan collateral are concentrated in the same cities. With a value of EUR 31 million, Helsinki has the highest share of credit institutions' commercial real estate collateral exposed to coastal flood risks. Second is Pori, where almost two per cent of commercial real estate collateral, with a value of EUR 25 million, is exposed to coastal flood risks. In addition to Helsinki and Pori, Espoo and Oulu also have commercial real estate collateral worth more than EUR 10 million exposed to coastal flood risks.

## Footnotes

1. Atreya et al. (2013), Forgetting the Flood? An Analysis of the Flood Risk Discount over Time. Land Economics 89; Bin et al. (2013) Changes in implicit flood risk premiums: Empirical evidence from the housing market. Journal of Environmental Economics and Management 65; Lamond and Proverbs (2006) Does the Price Impact of Flooding Fade away? Structural Survey 24. ↑
2. Coastal floods are becoming more common, although land uplift will reduce the impact, especially in the vicinity of the Northern Quark. ↑
3. See https://www.syke.fi/download/Suomen_merkittavat_tulvariskialueet_2018__2024/144a61da-ef94-4d8f-ac60-1eeda1460cd8/142472. ↑
4. See the Finnish Environment Institute's (SYKE) report on flood risks in Finland now and in the future (in Finnish) https://helda.helsinki.fi/bitstream/handle/10138/278893/SYKEra_30_2018.pdf?sequence=1&isAllowed=y. ↑
5. According to the National Land Survey, land uplift in Finland varies between 3–10 mm a year depending on the location. This post-glacial rebound is a slow, millennia long process due to rise of the land masses after the melting of the glaciers thousands of years ago. More information on the subject is available here: https://www.maanmittauslaitos.fi/en/research/interesting-topics/land-uplift. ↑
6. The risk increases depending on the intensity of climate change. ↑
7. Data by type of house, 2017. The average has been calculated on the basis of all dwellings, not only on the basis of owner-occupied housing, as flood risk data do not distinguish between owner-occupied, rental and right-of-occupancy housing. ↑
8. The figures do not include loans held by housing corporations or loans drawn down for the acquisition of other than owner-occupied dwellings, where the dwelling is used as collateral. ↑
9. Pori stands out in the statistics due to the city's relatively high number of small houses located in flood risk areas. The average size of housing loans for terraced and semi-

detached houses in Pori appears to be large in the data, approximately EUR 440/m2, which is more than, for example, EUR 388/m2 in Turku. This may be a pure coincidence made possible by the small sample size: only 54 households living in a terraced or semi-detached house in Pori are included in the data, which results in an inaccurate estimate of average debt size. ↑

10. Businesses and corporations have also used residential real estate as collateral. According to an estimate by the Bank of Finland, a total of around EUR 200 million of residential property used as collateral for bank loans is exposed to coastal flood risks. In addition to ordinary businesses, this figure includes properties used as loan collateral by housing corporations and public limited liability companies engaged in rental housing. The highest concentration of residential property used as collateral located in coastal flood risk areas is in Helsinki, Espoo and, in particular, Pori, where 4.5% of businesses' and communities' residential real estate collateral is exposed to coastal flood risks. ↑
11. Finnish coastal cities with more than 50,000 inhabitants in December 2017. ↑
12. SYKE has calculated the number of buildings and residents that a once-in-a-millennium flood would affect. Climate change will increase the frequency of such floods, making this a reasonably feasible risk scenario. ↑
13. The shares of commercial real estate collateral have been calculated so that the collateral is distributed evenly to each building in the postal code area. The number of buildings at risk of coastal floods has been divided by the total number of buildings in the postal code area. ↑



## Key words

climate change, flood risk, insurance, material damage