



## A Case for Climate Resilience

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Resilience and adaptation investments involve investing in tools now to mitigate loss in the future. This is a concept actuaries are very familiar with. In fact, resilience efforts are a lot like life insurance: you pay a smaller amount now so that if a bad day happens in the future, you'll be protected. People often feel that term life insurance can be a ripoff, because you may never get anything back. A common response to that thinking is that the consolation prize for never using your life insurance is that you lived! How do you quantify that benefit?

Similarly, most of us have health insurance, particularly for high-cost events like severe illness or injury. This does not stop us from going to the doctor to get an annual physical, vaccinations, or screenings. We understand that these actions, though they may feel unnecessary at the time, increase our resilience and help mitigate the bad day outcomes we hope to avoid. When faced with the question of whether you would rather have help rebuilding your house after a fire or never have your house burn down in the first place, I think we can all agree on the answer. Resilience is effective when the future loss is avoided, not when there's a payout associated with a future loss.

There's a common saying, "the best time to plant a tree is 20 years ago, the next best time is today." This applies to resilience investments as well, the best time to build a storm wall is 5 years before the last hurricane, the next best time is now, before the next one. This may all seem obvious to a risk management professional, but we don't get to make decisions in a vacuum. Resilience investments compete with other civic priorities for limited resources. They provide no immediate obvious benefit, material upfront costs, and therefore, often have limited support.

So, how can we help quantify the benefits of resilience investments and communicate them to the public in a way that resonates? Here are three ways: real world examples, stress testing, and insurance equivalents.

### REAL WORLD EXAMPLES

Stories are the brain's natural language. Concepts become embedded in our minds through stories. On January 31, 1953, the devastating North Sea Flood struck the Netherlands. The nation's series of dikes failed, with almost 500 breaches, and the resulting flooding was devastating. 1,836 people drowned, 182,000 livestock animals died, and over 46,000 buildings were destroyed or damaged. Estimated property damage costs in today's value exceeded 2 billion euros. Sea surge flooding had been a consistent problem haunting the Netherlands for thousands of years. The 1953 flood was the final catalyst where the public will and the technology aligned to address the problem.

Over the ensuing decades, the Netherlands embarked on an ambitious project, the Delta Works, to address the problem. The cornerstone project was a 400 million euro movable storm surge barrier, called Maeslantkering and completed in 1997, that would protect inland regions while preserving historic sites

and towns. The barrier automatically deploys when storm surge is projected above a certain threshold. In the 25+ years the barrier has been in operation, it has only automatically closed one time. But the Dutch people know that it is there and ready to protect them when the inevitable “big one” hits again. This provides peace of mind for economic and community flourishing in a way that the region has never known. The story and memory of the 1953 flood continued to motivate the Dutch people to invest in resilience for over 40 years.

## STRESS TESTING

We’ll use the Netherlands example throughout the rest of the paper to illustrate the other methods as well. Stress testing is a great way to demonstrate the impact of resilience investments. The Netherlands has storm surge data dating back to the 1700s, with less consistent records dating back a thousand years prior to that as well. This wealth of data can be used in projecting frequency of storm surge events in the future. Major disasters like the 1953 flood, along with numerous smaller events can be studied to estimate severity of each event (absent a flood barrier). These frequency and severity estimates can provide a baseline estimate of annual storm surge costs.

The Maeslantkering sea barrier can handle storm surges up to five meters. The 1953 flood was the only storm surge event in modern history above five meters, at 5.4. This could lead us to estimate that the barrier can reasonably be expected to protect against all storm surge events in its useful operational lifetime. Summing up annual costs over this period, we can develop an estimate of the economic value of creating the barrier.

Climate change, and the resulting sea level rise, is increasing the frequency and severity of storm surge events. Actuaries can use climate scenarios from the Network for Greening the Financial System (NGFS) or other bodies to estimate the increased frequency and severity of these severe events, including events above five meters. These estimations can show both the increasing value the resiliency investment generates from mitigating more events, and the potential new exposure from more severe events that the wall cannot fully mitigate.

## INSURANCE EQUIVALENTS

Finally, we can use the calculations in our scenario analysis to translate the impacts to a cost of insurance (COI) impact. A storm surge event would impact several different insurable assets including, homes, buildings, vehicles, ships, and lives. For simplicity’s sake, we’ll do the analysis on homes only. There are approximately 8 million homes in the Netherlands, with 60% of people living below sea level. So, let’s assume that means that 4.8 million homes ( $8m * 60\%$ ) are vulnerable to sea level rise. For simplicity, we’ll assume average annual premium is 1,000 euros. The total annual premium for exposed houses would be 4.8 billion euros. We’ll assume that the annual expected storm surge cost is 40 million euros (one 1 billion euro event every 25 years). Assuming no profit margin, accounting for variability, or other considerations, this implies that needing to cover the risk of storm surge would increase insurance premiums by approximately 8.3 euros a year. If we assume full mitigation and a 50-year useful life for a sea wall, the average cost per household would be 1.7 euros per year. The cost of not investing in resilience is five times more expensive than building the wall, not to mention the amount of lives saved and improved quality of life. These are mostly made-up numbers, but a similar analysis could be done with real data. Tying the impact to a value that the public understands, the cost of their homeowner’s insurance for example, could help create buy-in for large upfront investments.

## CONCLUSION

Resilience and adaptation investments are, at their core, practical tools for safeguarding communities against uncertain but potentially devastating future events. As the Netherlands' experience illustrates, the value of these investments is not measured by how often protective systems are triggered, but by the confidence and security they provide every day they stand ready. Through real-world examples, stress-testing analysis, and insurance-equivalent framing, we can translate complex risk-mitigation concepts into terms that resonate with both policymakers and the public.

Ultimately, the question is not whether resilience investments will eliminate all future loss. They will not. The question is whether the costs of preparedness today are justified by the avoided costs and preserved lives of tomorrow. When framed in this way, the answer becomes clear: resilience is not only a prudent financial strategy, but a societal imperative. By helping people understand these benefits in relatable, quantifiable terms, actuaries and risk professionals can play a critical role in building informed support for long-term investments that protect communities, strengthen economies, and enhance quality of life for generations to come.

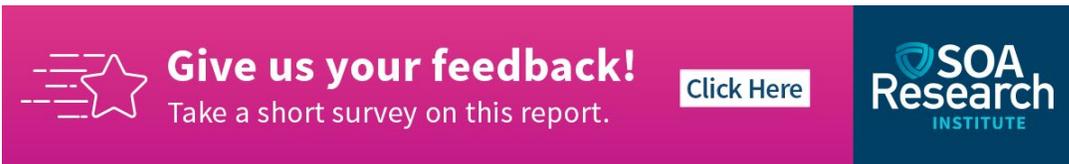
## SOURCES

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