Management Summary

Impact of Extreme Precipitation on the Dutch Social Housing Sector

Mart van den Hoek | M.Sc. Thesis, University of Twente | June 2026

Extreme rainfall is becoming more frequent and intense in the Netherlands; under the highest-emission scenarios its intensity could rise 10–30% by 2100. The resulting pluvial (rainfall-related) flooding can strike almost anywhere local drainage is overwhelmed, as the 2021 Limburg floods and the 2024 Enschede flash floods showed.

The Dutch social housing sector is highly exposed. Housing corporations own roughly 2.3 million dwellings, about 29% of the national stock, yet cannot raise rents to market levels, sell assets, or diversify geographically in response to risk. An estimated one third of their units face elevated pluvial risk, and no prior study has quantified this risk for the sector.

This thesis closes that gap with a nationwide simulation that estimates flood depths from 5 m terrain data and KNMI rainfall scenarios, converts them to structural damage through a Dutch-calibrated European depth–damage curve, and expresses the result as Value at Risk (VaR), Expected Shortfall, and Expected Annual Damage (EAD), validated against an independent professional flood model. The figures below cover the policy-relevant SSP5-8.5 2050 pathway, a high-end climate scenario at mid-century, and capture direct repair costs, a lower bound on total exposure.

Four findings

1. **The losses are material.** A 100-year event produces an estimated **EUR 457 million** in direct structural damage (the 99% VaR). This assumes one storm strikes the whole country at once and is therefore an upper bound; the geographic spread of a nationwide portfolio places the realistic figure lower, with EUR 117 million as a conservative floor. Annualised, Expected Annual Damage lies between roughly EUR 17 million and EUR 64 million per year. The lower figure counts only the rarer events for which the model is best validated; the upper figure also includes frequent events at face value, where the model is known to overestimate. Correcting for that overestimation gives a **central estimate of about EUR 34 million per year**.
2. **The risk is driven by shallow water, not rare deep floods.** As rainfall intensifies, losses grow almost entirely because more ground-floor dwellings cross the damage threshold, not because flooded homes flood deeper. This threshold-crossing mechanism is the central finding: modest measures raising the effective entry height, such as door barriers or street-level drainage, act precisely at the margin that dominates portfolio risk.
3. **The losses are absorbable nationally but tightly concentrated.** The EUR 457 million shock equals about 18% of one year of the sector's aggregate operating cashflow, so it does not threaten solvency. Yet a few regions, led by Regio Rotterdam, Haaglanden, and Stedelijke Regio Breda–Tilburg, carry the highest exposure per dwelling, and under a one-off shock Breda–Tilburg is the only one whose Interest Coverage Ratio falls below the Aw/WSW norm of 1.4. The binding constraint is not solvency but the squeeze on cashflow already committed under the Nationale Prestatieafspraken to new construction, sustainability, and affordability targets.
4. **Inaction compounds.** Holding the 2050 distribution constant, thirty years without adaptation accumulate an expected **EUR 505 million** in direct damage (about EUR 377 million in present value at 2% real), and a 25-year event is more likely than not to strike at least once in that window. Because these losses are recurring, regionally concentrated, and near-certain to materialise, the case for adaptation rests on the avoidable, predictable cost that delay locks in.

Recommendations

Pluvial risk should be treated as a real item in long-term financial planning and supervisory stress testing. Adaptation should be prioritised on both aggregate exposure and damage per dwelling. Finally, early investment is warranted in shallow-water entry prevention and in the asset-level data that could replace today's conservative assumptions.