

Historic and future extreme weather risks: what do we know currently and what could be improved?

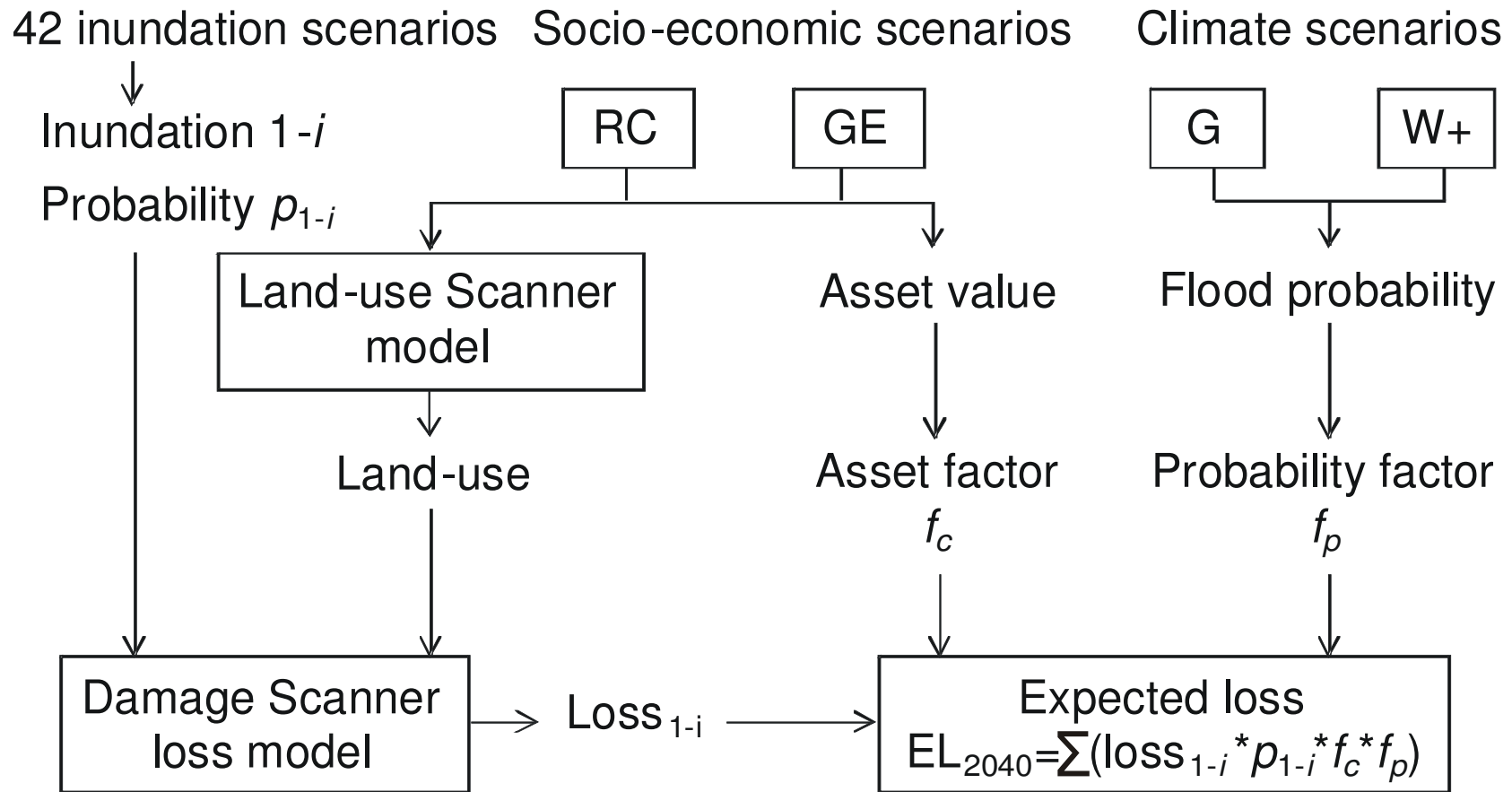
Laurens M. Boucher

with Jeroen Aerts, Philip Bubeck, Philip Ward, and Bob Maaskant, Bas Jonkman (TU Delft)

Overview

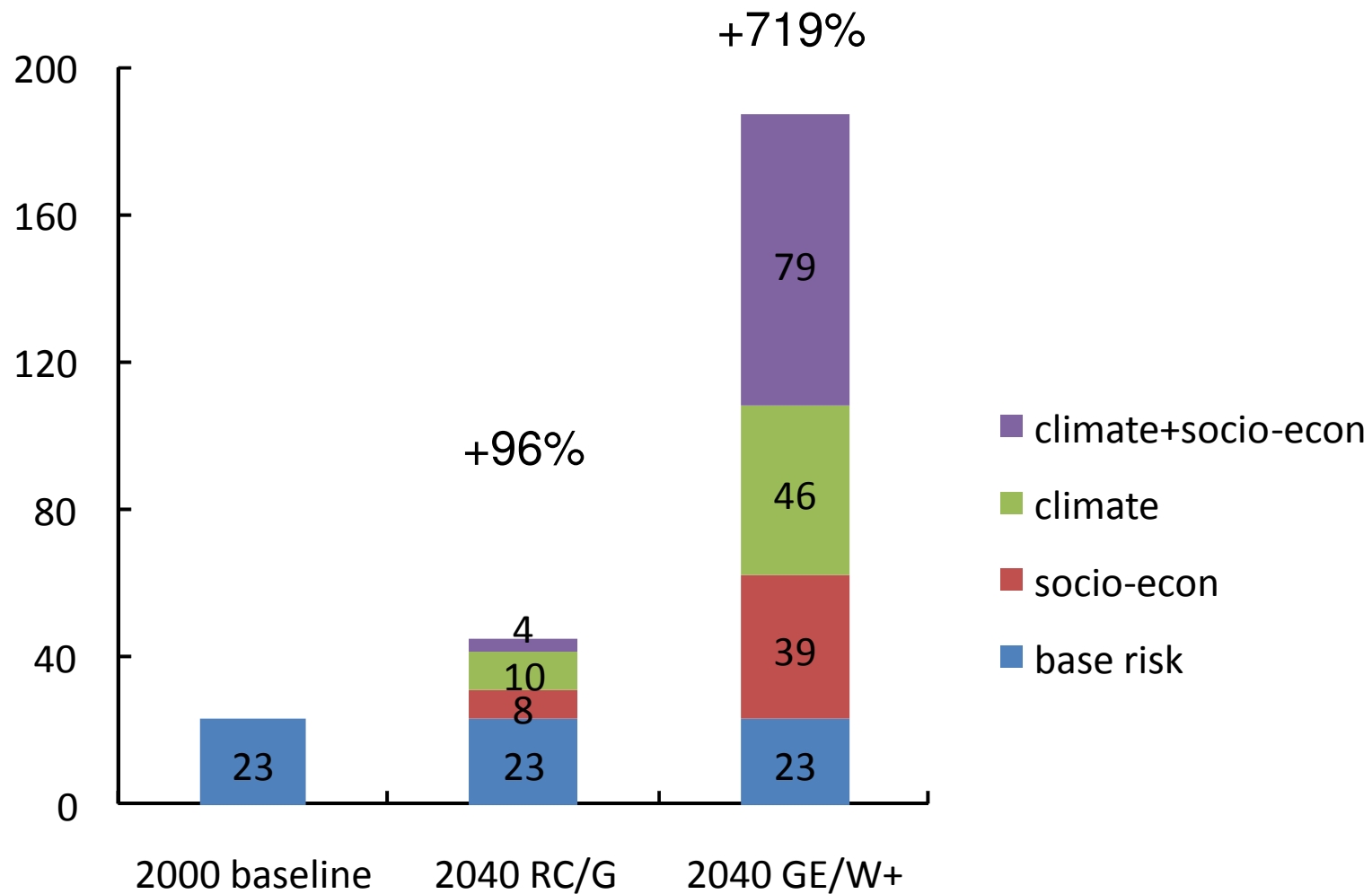
- Projection studies
- Conclusions
- Normalisation studies
- Conclusions and outlook

Estimates of future flood risk: Potential damage in The Netherlands



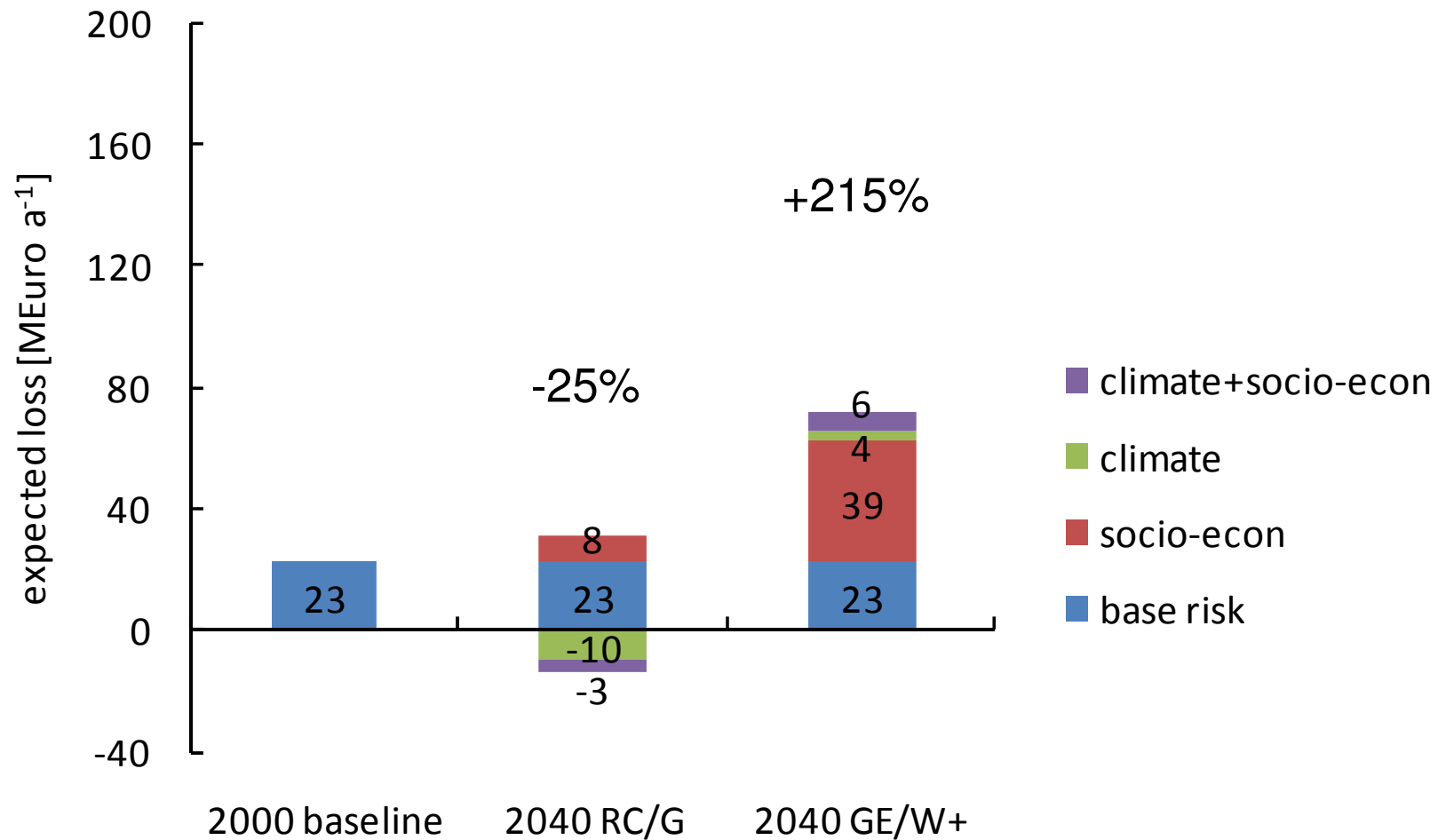
Bouwer et al 2010, *GEC*

Potential flood damage in 2040 (no adaptation)



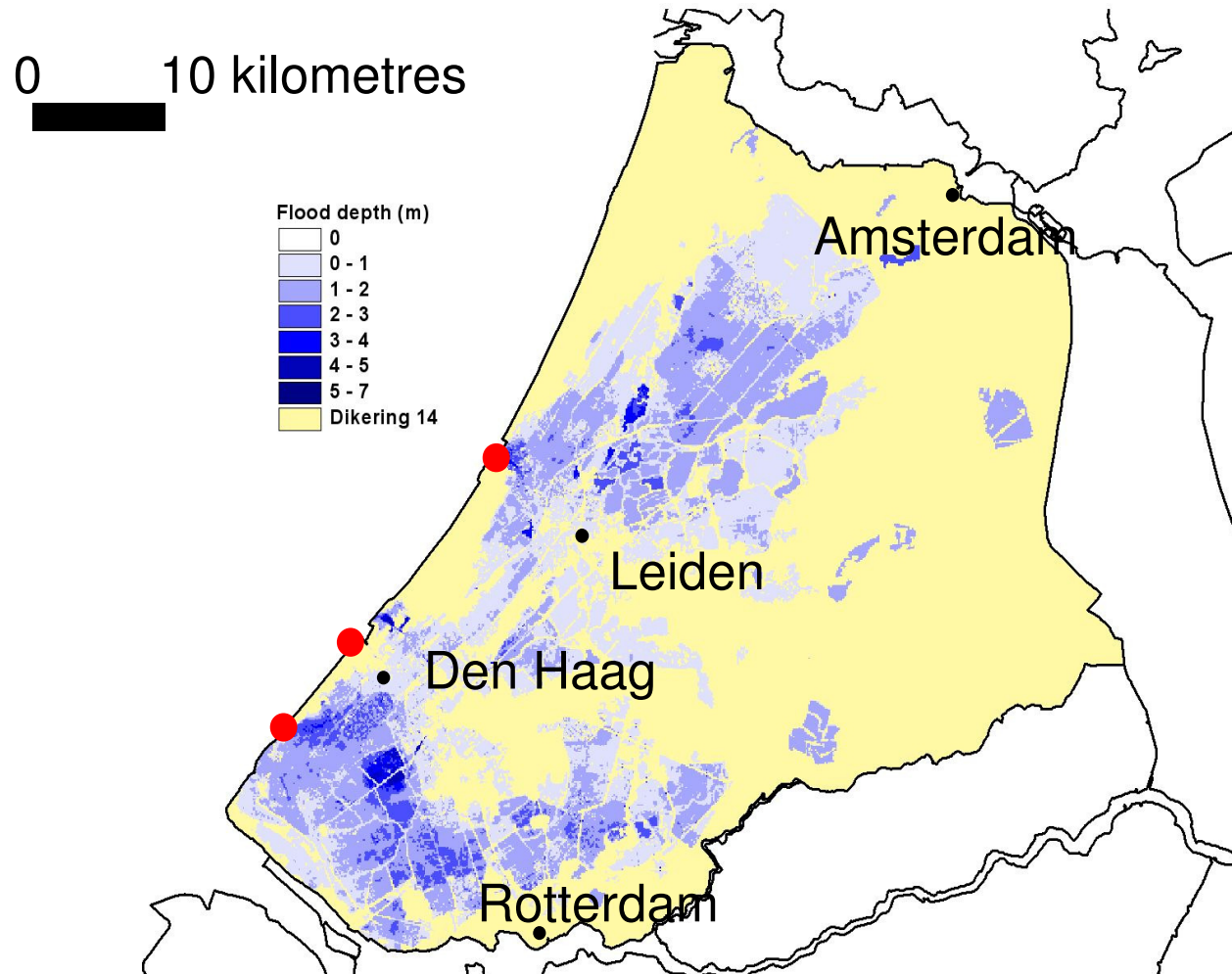
Bouwer et al 2010, *GEC*

Effect of flood prevention in 2040



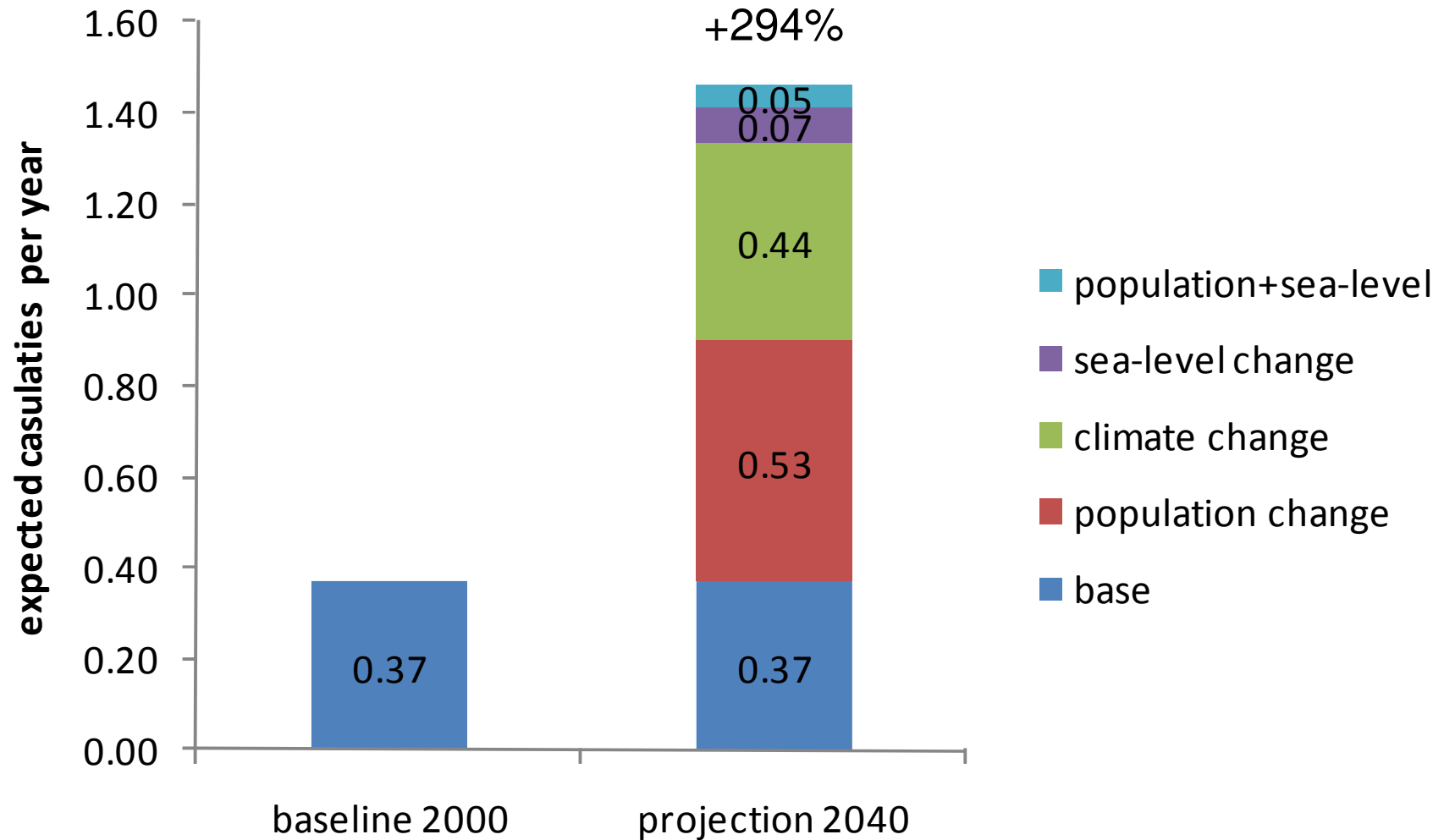
Bouwer et al 2010, *GEC*

Estimates of future flood risk: Potential casualties in The Netherlands



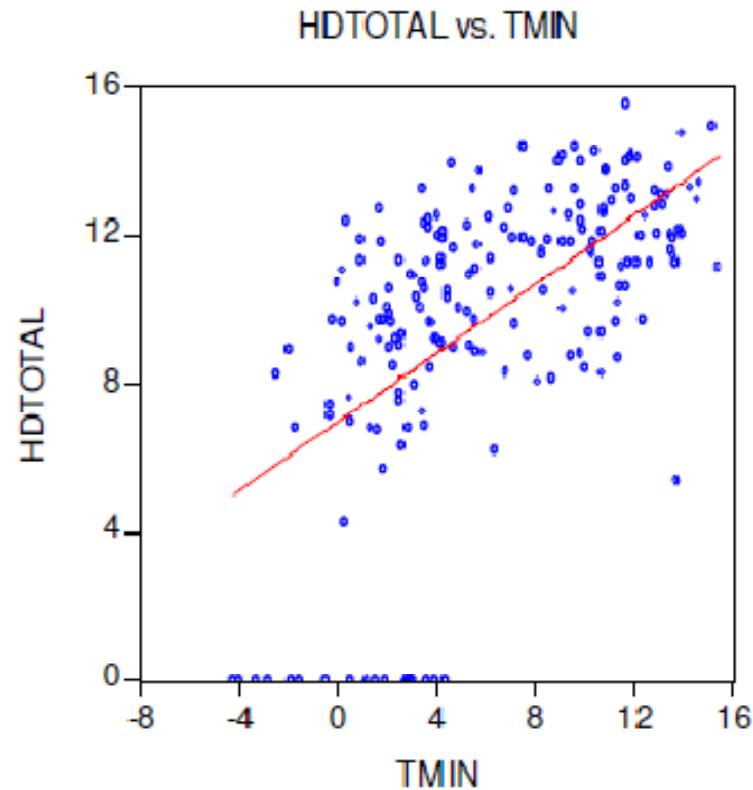
Maaskant et al. 2009, *ESP*

Casualties potential in 2040 (no adaptation)



Maaskant et al. 2009, *ESP*

Hail damage to agriculture, The Netherlands



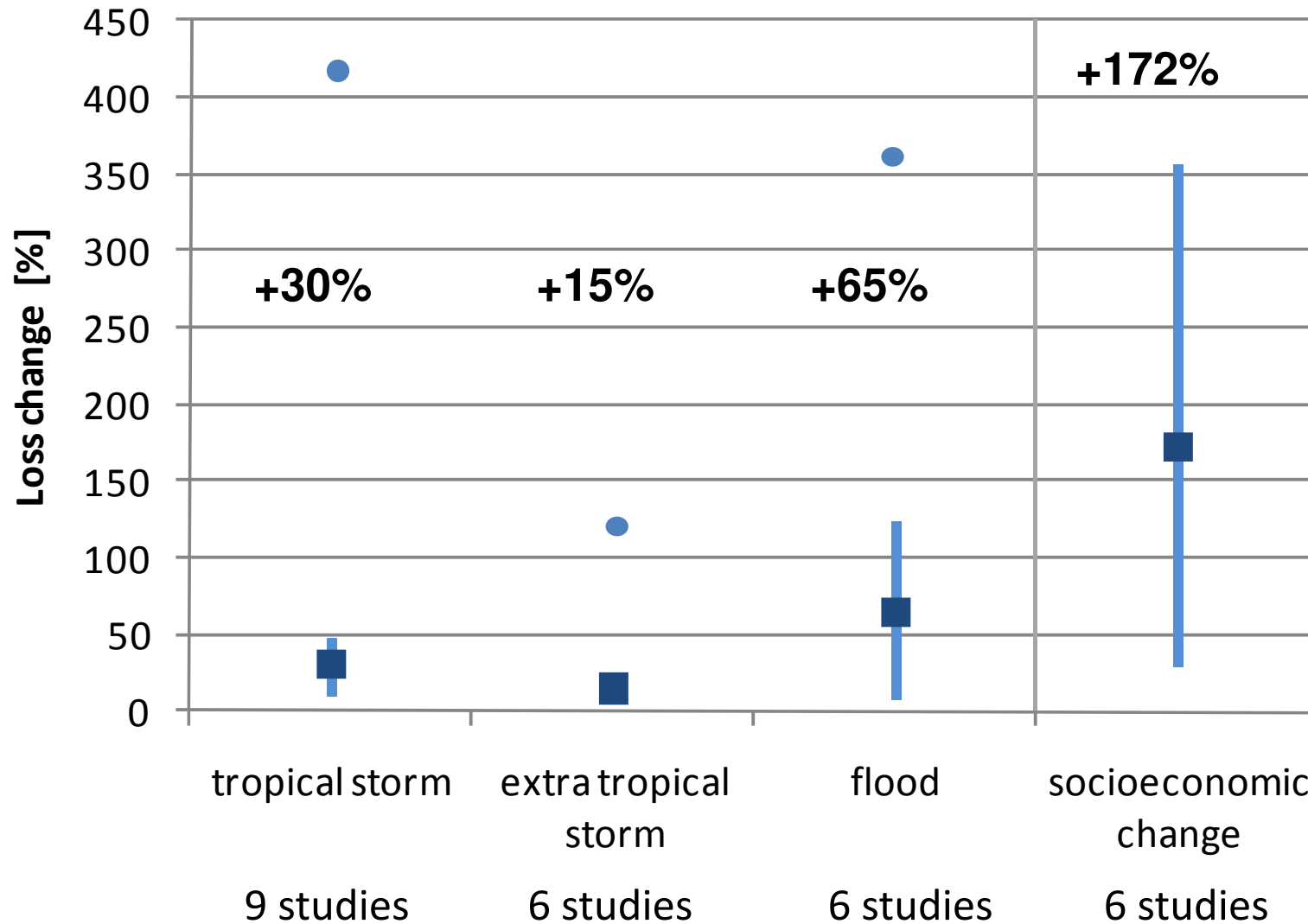
Estimates for 2050:

+25-50% increase for outdoor crops

+200% increase for
greenhouse horticulture

Botzen et al. 2010, *REE*

Impact of climate change on loss potential in 2040



Bouwer, submitted to *Risk Analysis*

Conclusions from projection studies

- Future climate change will increase disaster risk (potential economic losses and casualties)
- At least equal/but probably larger effect from increasing population and asset values
- Differences between types of weather hazards
- Amplification effect of driving factors
- Signal unlikely to be found, because of adaptation and climate variability
- Loss volatility → study the role of variability

Why place link between damages and climate variability?

- Long data series are scarce: therefore look at short-term variability
- First-order estimate of potential climate change impacts:
Which damages are sensitive to what fluctuations?
- Comparison of signal due to variability, versus change
- Explanation of contemporary losses
- Prediction purposes?

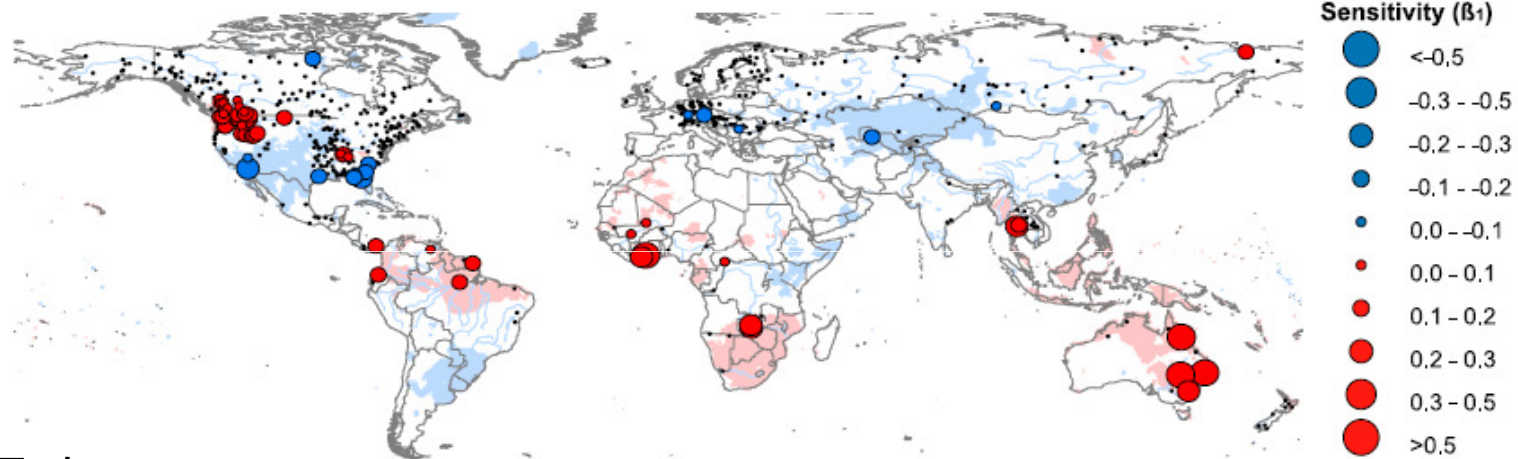
Increase in damages due to anthropogenic climate change?

Number of studies	No trend	Increase	Increase due to human induced climate change
Wildfire	1	0	0
Storm	6	2	?
Flooding	3	2	?
Tornado, thunderstorm hail	2	2	?
Various weather	3	0	0
Total	15	6	?

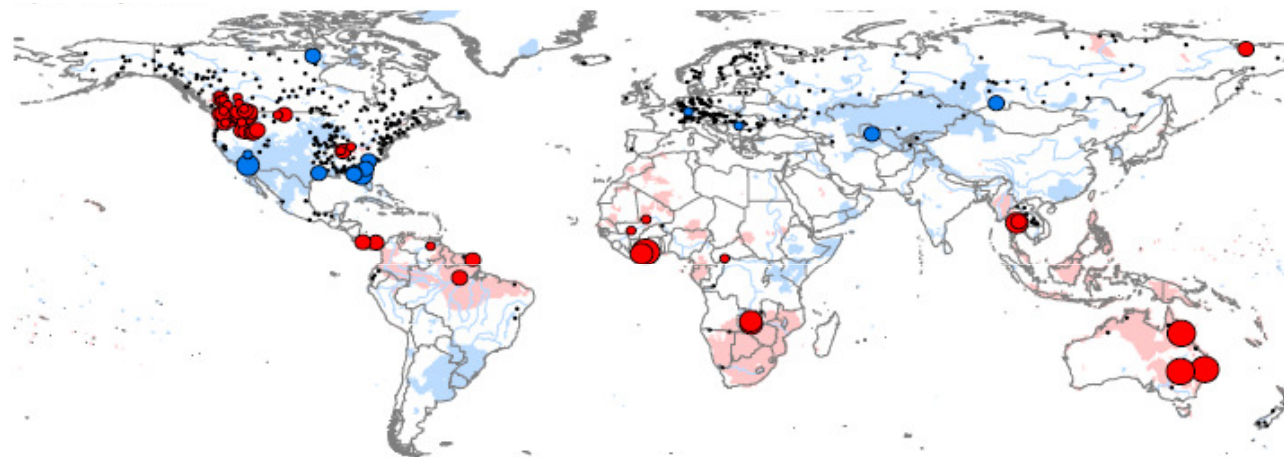
Bouwer in press, *BAMS*

ENSO and peak river discharge sensitivities

1-day max

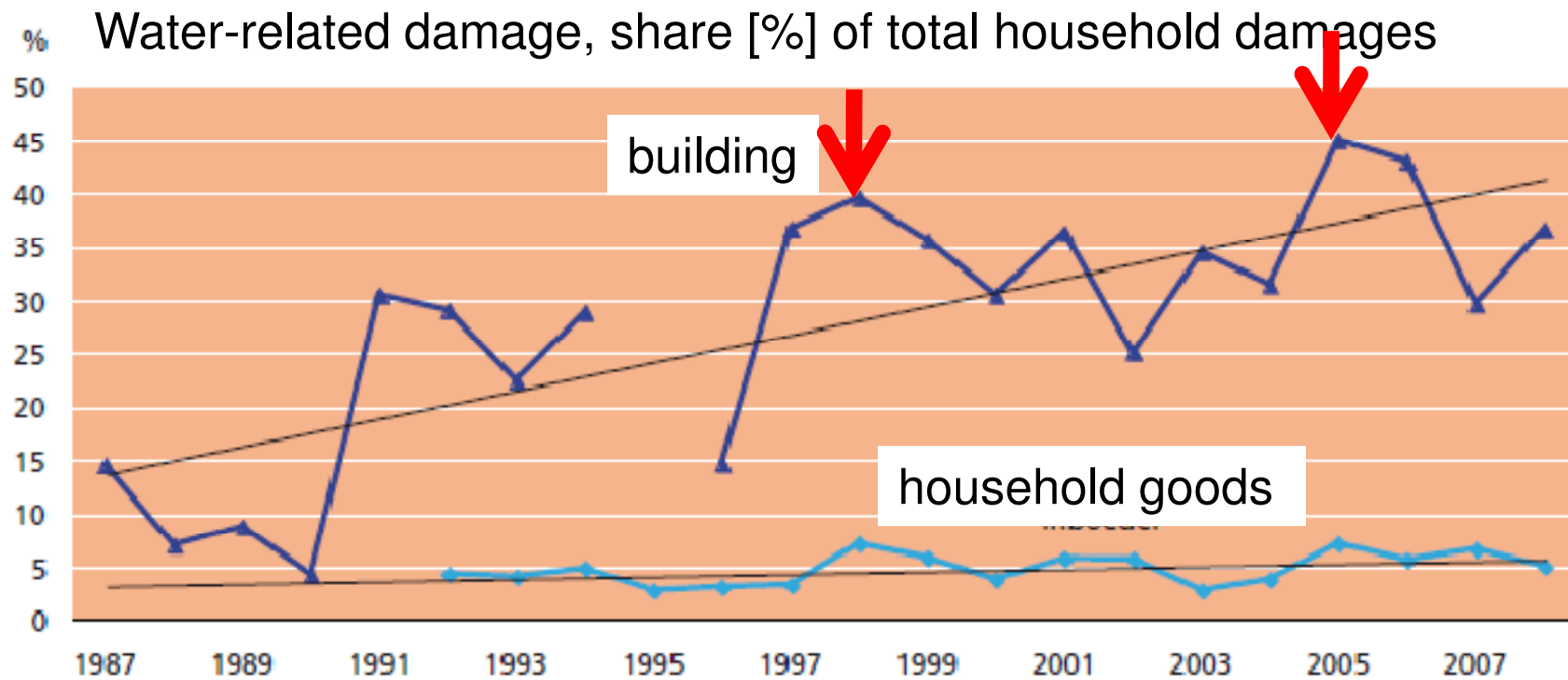


7-day max



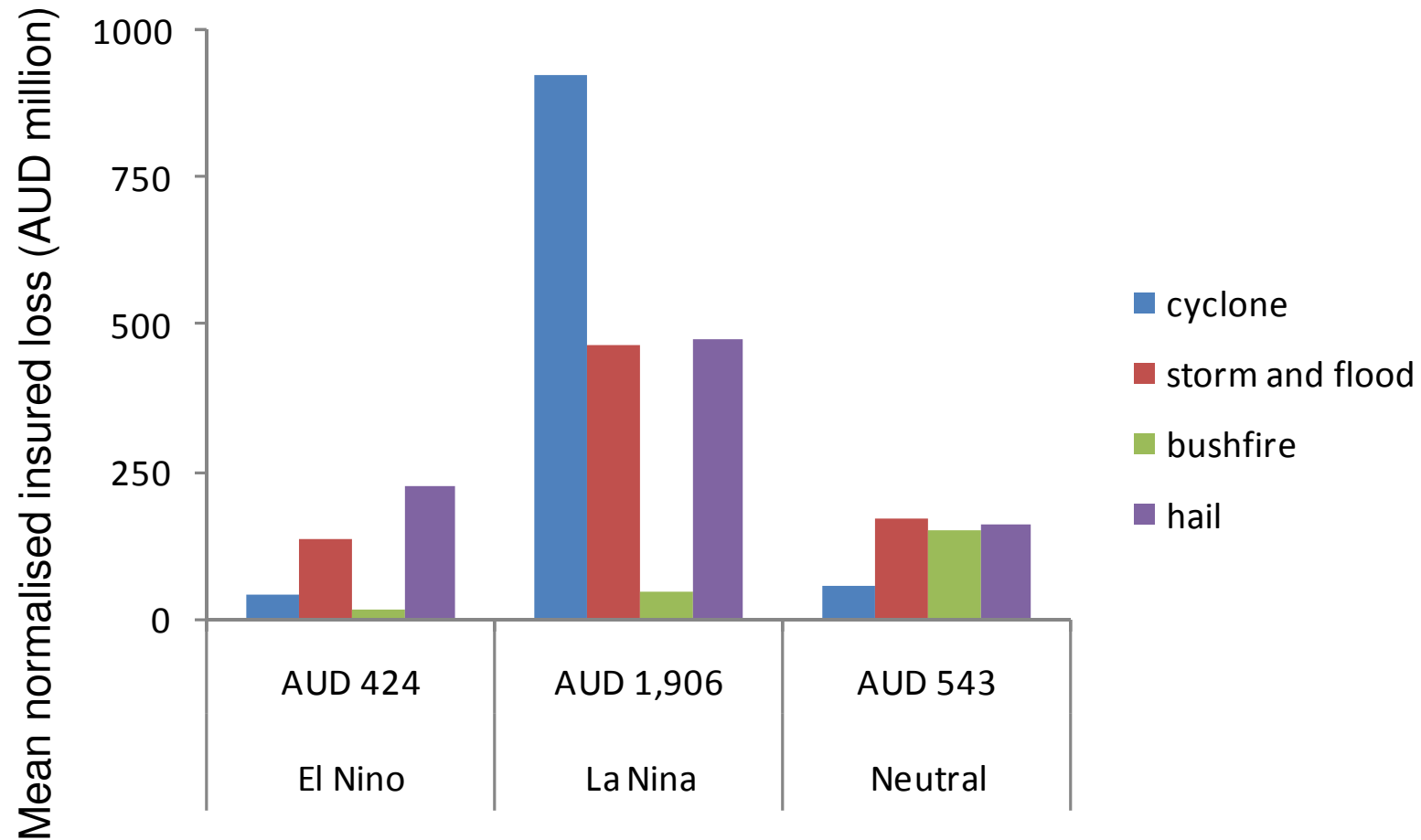
Ward et al. 2010, *GRL*

Variability in water and rainfall related damages: The Netherlands



Dutch Association of Insurers 2010

Climate variability and normalised losses: Australia 1967-2005



Conclusions and prospects for improvements

- Trends unlikely to be found in loss data
- But continue to study normalised data:
 - Try to explain variations, rather than trends
 - Further explore role of exposure and vulnerability reduction
 - Use this knowledge for projections
- Forecasts of losses?

Thank you!

Some references to our work:

- Botzen *et al.* 2010, *REE* <http://dx.doi.org/10.1016/j.reseneeco.2009.10.004>
- Bouwer in press, *BAMS* <http://dx.doi.org/10.1175/2010BAMS3092.1>
- Bouwer *et al.* 2010, *GEC* <http://dx.doi.org/10.1016/j.gloenvcha.2010.04.002>
- Maaskant *et al.* 2009, *ESP* <http://dx.doi.org/10.1016/j.envsci.2008.11.004>
- Ward *et al.* 2010, *GRL* <http://dx.doi.org/10.1029/2010GL043215>