European Commercial Real Estate Data Alliance (E-CREDA)

European Commercial Real Estate Data Alliance
E-CREDA 2025 Annual Conference

Data-driven real estate & the future of investment decisions in an uncertain world

European Commercial Real Estate Data Alliance (E-CREDA)

Lukas Hofmann
Sinking land, sinking prices

University of Amsterdam
Amsterdam Business School

E-CREDA Annual Conference

Sinking Land, Sinking Prices?

Land Subsidence, Flood Risk and Property Prices

Lukas Hofmann
Martijn Dröes
Marc Francke
16 May 2025


1988
USGS
Science for a changing world
2004
2008
H 1235
2016

Land Subsidence

- Lowering of the land surface

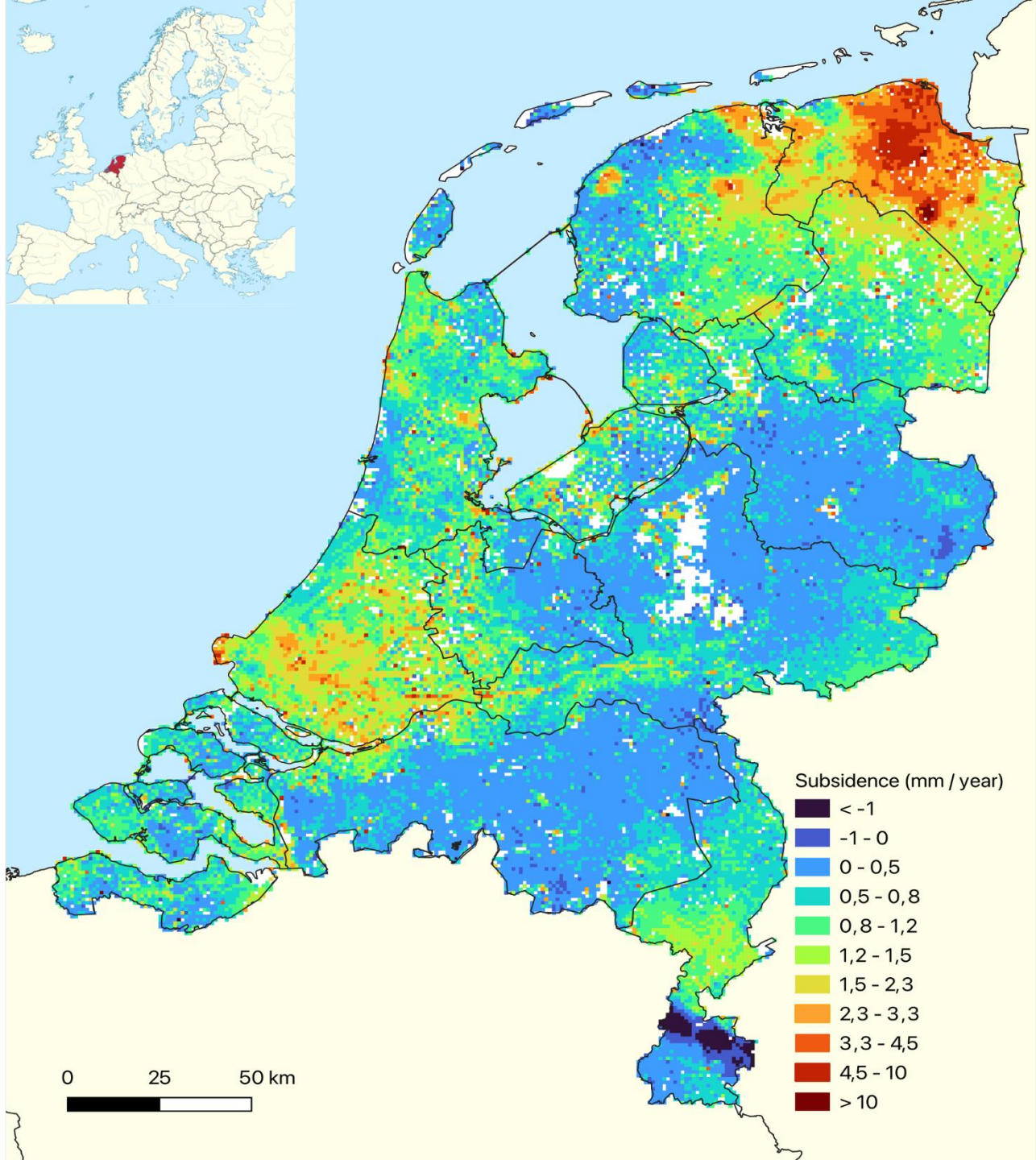
- Causes:
  - Groundwater extraction
  - Dehydration of soft soils (peat & clay)
  - Extraction of minerals
  - Exacerbated by droughts

University of Amsterdam
Amsterdam Business School

Current subsidence

- Based on InSAR technology
  - Satellite measurements from six positions
  - 305 million points measured every 12 days
  - Linear trend 2017 - 2021

- Available under bodemdalingskaart.nl

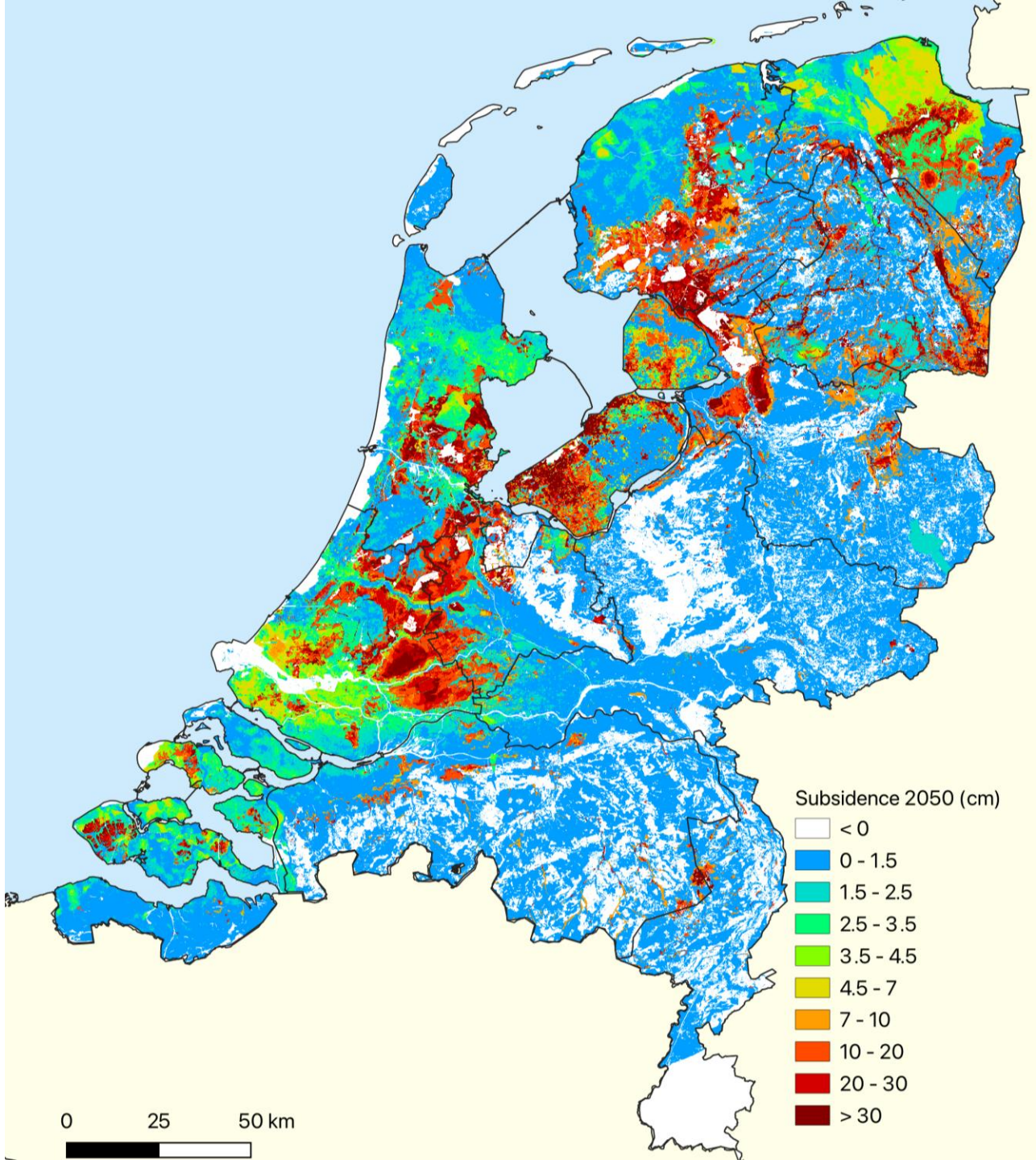


University of Amsterdam
Amsterdam Business School

Future subsidence

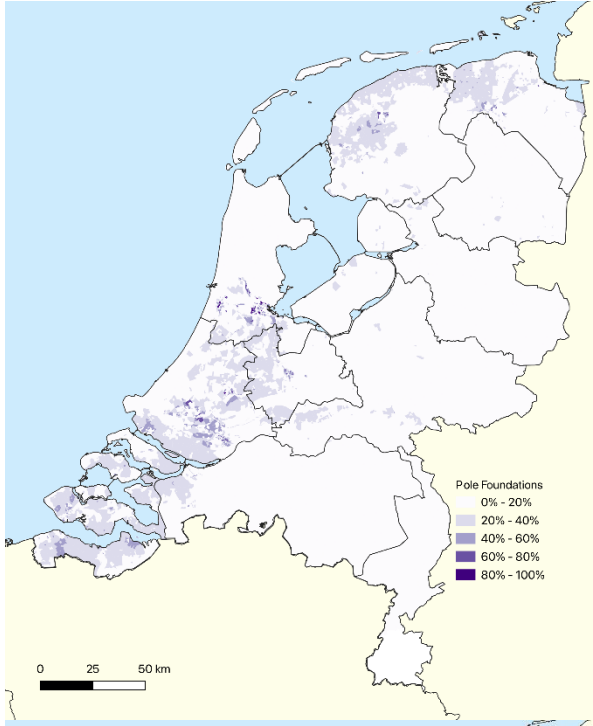
- Based on model calculations from Deltares
  - Impact of climate change
  - Water level management
  - Here high impact scenario until 2050

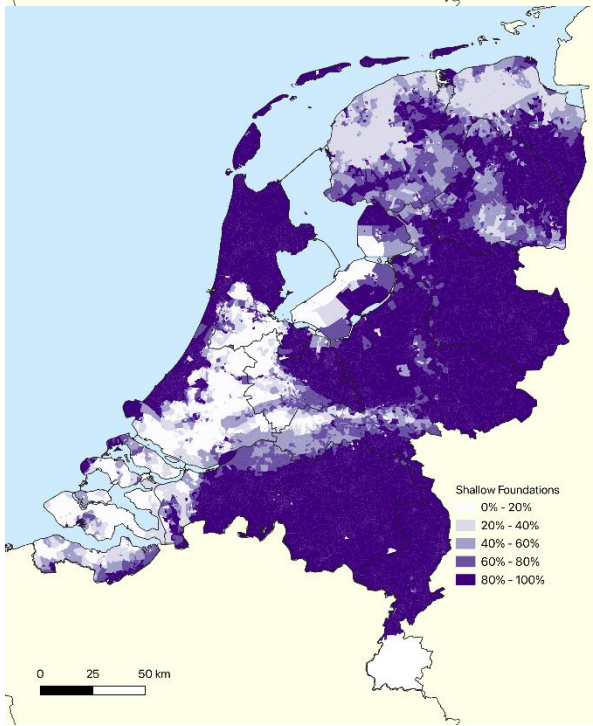
- Available under klimaateffectatlas.nl



Direct effect

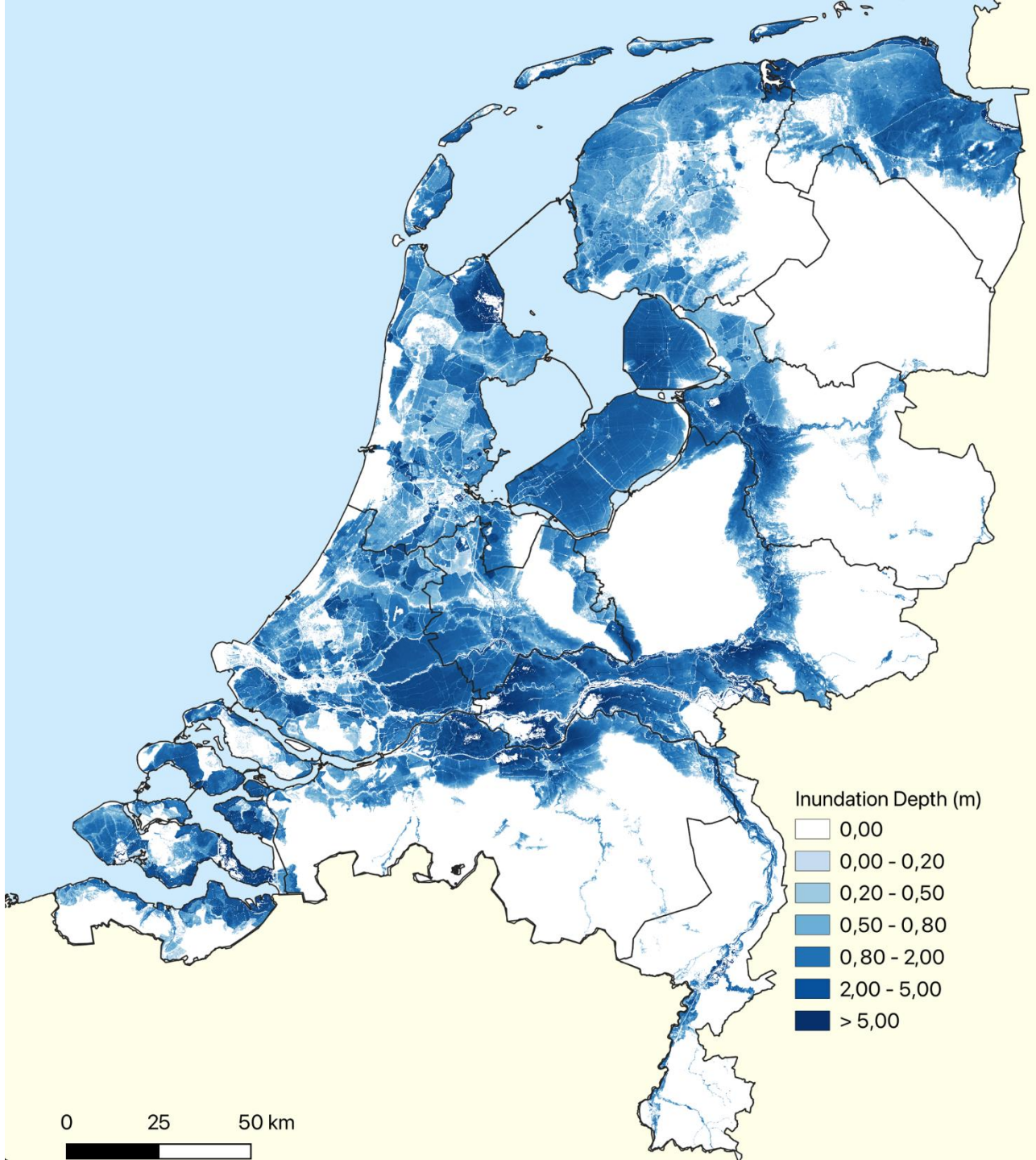
- Subsidence can damage the foundation of a property
  - Cost of repairing a foundation range from € 10,000 - € 100,000
- Affected: pole foundations and shallow foundations
- Concrete foundations (after ~1975) are unaffected





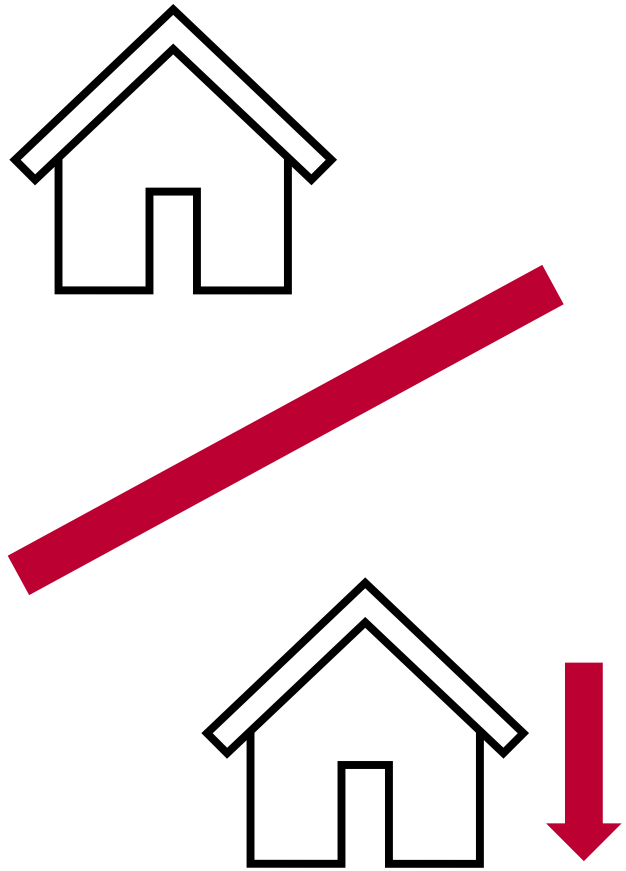
Indirect effect

- Subsidence makes properties more vulnerable to flooding
- Expected damage increases in inundation depth
  - Figure shows 1/100,000 years flood event



Analysis

- NVM data on 1.4 million transactions, 2010-2021
- Do properties exposed to foundation/ flood risk trade at discounted prices if the property is affected by subsidence?
- Compare affected properties to close by properties that are not affected, controlling for housing characteristics and other confounding factors



Results

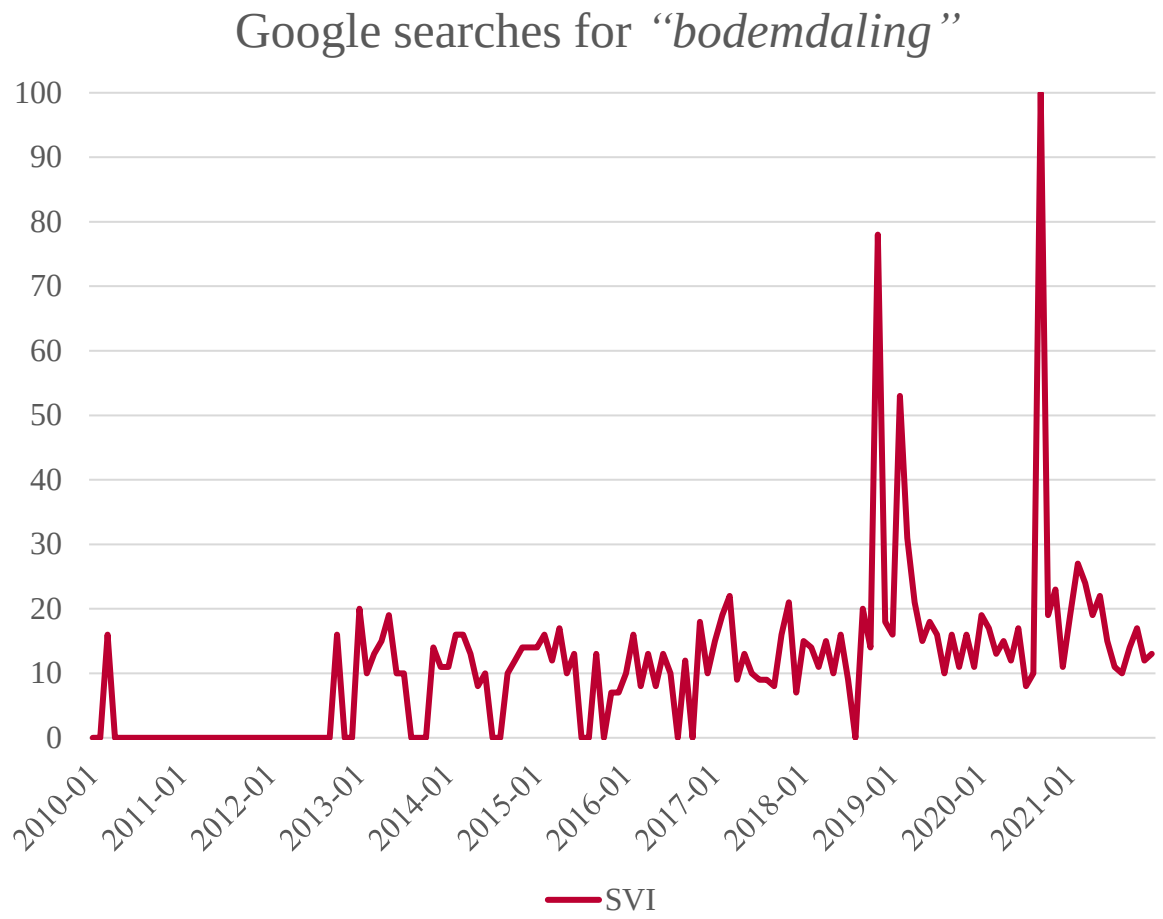
- Pre-1980 properties exposed to *current* subsidence are 0.8% cheaper
- Flood-prone properties exposed to *future* subsidence are 1.5% cheaper
- Price of transacted properties reduced by € 1 billion
  - Total housing stock: € 6 billion (0.7% of Dutch GDP in 2021)

Discussion

- Buyers expect foundation damage with probability 2.3%-23.2%, for properties most at risk
  - ➢Likely an *underestimation*, 17% of Dutch properties might be affected
- Buyers anticipate a flood with annual probability of 1.5% (1/70 years)
  - ➢*Overestimation* compared to official risk levels (1/100,000 years)

Salience

- Peaks around the release of subsidence maps
- In most salient months, all subsiding properties trade at a discount
  - ➢*Smaller* for properties most at risk
- Further suggests that better disclosure is needed
  - ➢Climate label?



UNIVERSITY OF AMSTERDAM
Amsterdam Business School

Thank you for your attention!

Amsterdam Business School

Finance Department

Universiteit van Amsterdam

l.hofmann@uva.nl

Descriptive Statistics – Transactions

Statistic	N	Mean	St. Dev.	Min	Max
Price (€)	1,441,391	290,974	190,474	12,500	2,500,000
Size in m^2	1,440,482	122.846	50.848	25	2,400
Number of rooms	1,441,391	4.638	1.586	1	198
Number of bathrooms	1,441,391	0.900	0.509	0	8
Terraced property	1,441,391	0.428	0.495	0	1
Semi-detached property	1,441,391	0.154	0.361	0	1
Detached property	1,441,391	0.147	0.354	0	1
Property has garden	1,441,391	0.630	0.483	0	1
Property has garage	1,441,391	0.277	0.448	0	1
Property has central heating	1,441,391	0.938	0.241	0	1
Maintenance is good	1,441,391	0.858	0.350	0	1
Property is listed as monument	1,441,391	0.010	0.099	0	1
Constructed 1945-1959	1,441,391	0.080	0.272	0	1
Constructed 1960-1970	1,441,391	0.151	0.358	0	1
Constructed 1971-1980	1,441,391	0.162	0.369	0	1
Constructed 1981-1990	1,441,391	0.130	0.336	0	1
Constructed 1991-2000	1,441,391	0.131	0.337	0	1
Constructed after 2000	1,441,391	0.115	0.319	0	1

Descriptive Statistics – Climate Risks

Statistic	N	Mean	St. Dev.	Min	Max
Current subsidence (m)	1,441,391	0.001	0.001	−0.026	0.030
> 0 mm	1,441,391	0.871	0.335	0	1
> 3.3 mm	1,441,391	0.268	0.443	0	1
> 6.7 mm	1,441,391	0.013	0.112	0	1
Future subsidence (m)	1,441,248	0.040	0.098	0	1.104
> 0 cm	1,441,248	0.220	0.415	0	1
> 10 cm	1,441,248	0.102	0.303	0	1
> 20 cm	1,441,248	0.067	0.250	0	1
Floods 1/10 years	1,439,002	0.001	0.034	0	1
Inundation depth (m)	1,439,002	0.001	0.028	0	4.964
Floods 1/100 years	1,439,002	0.127	0.333	0	1
Inundation depth (m)	1,439,002	0.109	0.414	0	7.300
Floods 1/1,000 years	1,439,002	0.338	0.473	0	1
Inundation depth (m)	1,439,002	0.428	0.833	0	12.180
Floods 1/100,000 years	1,439,002	0.513	0.500	0	1
Inundation depth (m)	1,439,002	0.746	1.071	0	12.620
Search volume intensity	1,441,391	0.122	0.134	0	1
× current subsidence > 3.3 mm	1,441,391	0.033	0.088	0	1
× future subsidence > 10 cm	1,441,248	0.013	0.057	0	1
Search volume intensity (province adjusted)	1,441,391	0.031	0.049	0	1
× current subsidence > 3.3 mm	1,441,391	0.012	0.041	0	1
× future subsidence > 10 cm	1,441,248	0.003	0.019	0	1
Current subsidence × Built before 1980	1,441,391	0.170	0.376	0	1
Current subsidence × Floods 1/100,000 years	1,439,002	0.164	0.371	0	1
Future subsidence × Built before 1980	1,441,248	0.050	0.218	0	1
Future subsidence × Floods 1/100,000 years	1,438,894	0.076	0.265	0	1