

# PRECIPITATION AND RESULTING LOSSES FOR INSURERS IN RELATION TO CLIMATE CHANGE

Centre for Insurance Statistics (CVS)  
Dutch Association of Insurers

drs. H.A. Ririassa (researcher)  
dr. A.H. Hoen (researcher)  
ir. H.F. Treur (manager)

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## Topics

1. Data
2. Relationship between rainfall and insurance claims
3. Financial impact climate change



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## Insurance data

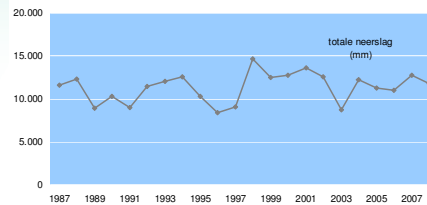
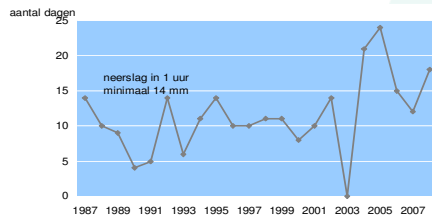
- 1.4 million policies on household insurance since 1992
- 0.7 million policies on home insurance since 1987
- Individual policy records (household and homes):
  - Zipcode
  - Insurance cover
  - Type of building
  - Insured amount
- Individual claims records (household and homes)
  - Claim amount
  - Type of claim (storm, fire, water,..)
  - Date of the insured incident

## Key figures rainfall related claims

- Claimed amount household: € 10 million (2008)
- Claimed amount home: € 80 million (2008)

| date       | Max amount per day claimed<br>on home insurance (€ mln) |
|------------|---|
| 25-11-2005 | 8,3   |
| 18-01-2007 | 6,3   |
| 06-06-1998 | 6,2   |
| 22-06-2008 | 6,2   |
| 05-07-1999 | 5,2   |

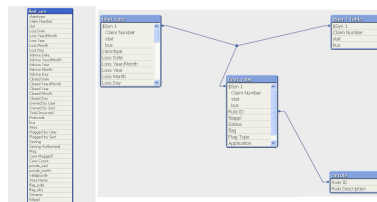
## Trend analysis rainfall



- 2004, 2005 en 2008 more than average number of days with intense rainfall (>14 mm per hour)
- 2003 extremely dry
- average rainfall stable

## Combining the datafiles

- 14 weather stations used in the study
- Data combined per region
- Data combined on date



## Rainfall claims on household property insurance

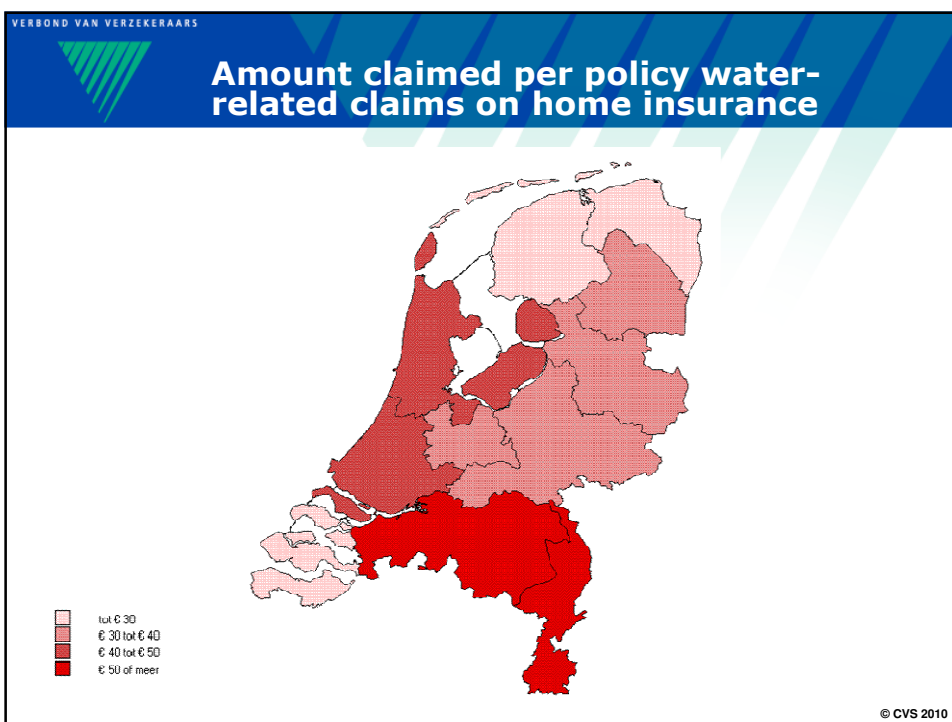
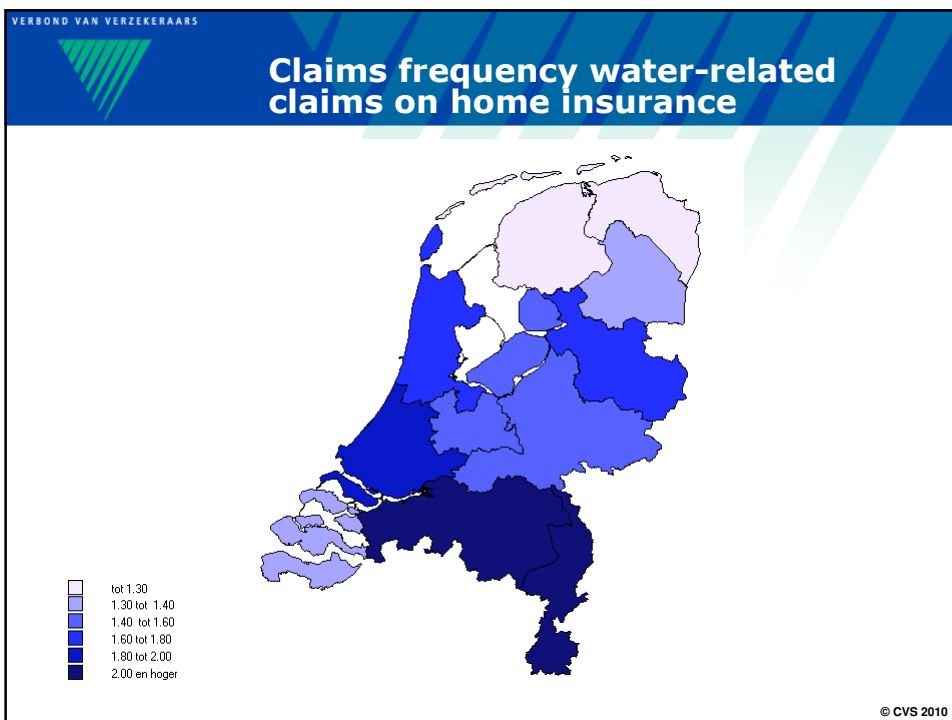
| Province      | Claim frequency (%) | Average amount per claim (€) | Amount per policy (€) |
|---------------|---------------------|------------------------------|-----------------------|
| Limburg       | 0,146               | 1.254                        | 1,83                  |
| Zuid-Holland  | 0,159               | 1.074                        | 1,71                  |
| Noord-Holland | 0,139               | 1.044                        | 1,45                  |
| Noord-Brabant | 0,143               | 991                          | 1,42                  |
| Overijssel    | 0,146               | 848                          | 1,24                  |
| Utrecht       | 0,145               | 852                          | 1,24                  |
| Drenthe       | 0,130               | 913                          | 1,19                  |
| Zeeland       | 0,142               | 792                          | 1,12                  |
| Gelderland    | 0,130               | 791                          | 1,03                  |
| Flevoland     | 0,125               | 802                          | 1,00                  |
| Groningen     | 0,132               | 718                          | 0,95                  |
| Friesland     | 0,127               | 738                          | 0,94                  |
| Total         | 0,144               | 968                          | 1,40                  |

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## Water related claims on private home insurance

| Province      | Claims frequency (%) | Amount per claim (€) | Amount per policy (€) |
|---------------|----------------------|----------------------|-----------------------|
| Limburg       | 2,96                 | 1.840                | 54                    |
| Noord-Brabant | 2,64                 | 2.050                | 54                    |
| Zuid-Holland  | 1,92                 | 2.220                | 43                    |
| Flevoland     | 1,49                 | 2.750                | 41                    |
| Noord-Holland | 1,63                 | 2.480                | 40                    |
| Utrecht       | 1,50                 | 2.240                | 34                    |
| Overijssel    | 1,64                 | 2.020                | 33                    |
| Drenthe       | 1,32                 | 2.490                | 33                    |
| Gelderland    | 1,51                 | 2.060                | 31                    |
| Zeeland       | 1,31                 | 2.210                | 29                    |
| Groningen     | 1,16                 | 2.400                | 28                    |
| Friesland     | 1,08                 | 2.310                | 25                    |
| Total         | 1,83                 | 2.210                | 40                    |

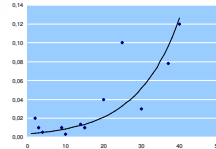
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## Household property insurance

- The relationship between rainfall and claims on household property

$$\text{Claims frequency} = e^{(a+bx)}$$



- a and b model parameters per province
- x = maximum rainfall in an day per hour (mm)
- Claims frequency = number of claims per 100 policies
- A different model for each province

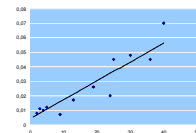
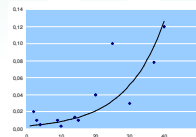
## Private home insurance

- The relationship between rainfall and water-related claims on home insurance

$$\text{Claims frequency} = e^{(a+bx)}$$

or

$$\text{Claims frequency} = a + bx$$



- a and b model parameters per province
- x = maximum rainfall in a day per hour (mm)
- Claims frequency = number of claims per 100 policies
- different model (linear and exponential) per province

## Climate scenarios KNMI

- Moderate scenario: 1°C temperature rise
- Warm scenario: 2°C temperature rise

| Rainfall per hour (mm) |         |          |      |
|------------------------|---------|----------|------|
| Frequency              | current | moderate | warm |
| Once per year          | 14      | 15       | 17   |
| Once every 10 years    | 27      | 30       | 33   |
| Once every 100 years   | 43      | 48       | 53   |

## Current situation

### Precipitation per hour once a year

| Current climate |           |
|-----------------|-----------|
| Province        | 14 mm     |
| Noord-Holland   | € 210.000 |
| Zuid-Holland    | € 355.000 |
| Total           | € 565.000 |

### Precipitation per hour once every 10 years

| Current climate |             |
|-----------------|-------------|
| Province        | 27 mm       |
| Noord-Holland   | € 375.000   |
| Zuid-Holland    | € 640.000   |
| Total           | € 1.015.000 |

### Precipitation per hour once every 100 years

| Current climate |             |
|-----------------|-------------|
| Province        | 43 mm       |
| Noord-Holland   | € 570.000   |
| Zuid-Holland    | € 990.000   |
| Total           | € 1.560.000 |

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## G scenario +(6% - 11%)

Precipitation per hour once a year

|               | Current climate | G-scenario |     |
|---------------|-----------------|------------|-----|
| Province      | 14 mm           | 15 mm      |     |
| Noord-Holland | € 210.000       | € 225.000  | +7% |
| Zuid-Holland  | € 355.000       | € 375.000  | +6% |
| Total         | € 565.000       | € 600.000  | +6% |

Precipitation per hour once every 10 years

|               | Current climate | G-scenario  |      |
|---------------|-----------------|-------------|------|
| Province      | 27 mm           | 30 mm       |      |
| Noord-Holland | € 375.000       | € 410.000   | + 9% |
| Zuid-Holland  | € 640.000       | € 705.000   | +10% |
| Total         | € 1.015.000     | € 1.115.000 | +10% |

Precipitation per hour once every 100 years

|               | Current climate | G-scenario  |      |
|---------------|-----------------|-------------|------|
| province      | 43 mm           | 48 mm       |      |
| Noord-Holland | € 570.000       | € 630.000   | +11% |
| Zuid-Holland  | € 990.000       | € 1.100.000 | +11% |
| Total         | € 1.560.000     | € 1.730.000 | +11% |

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## W scenario +(18% - 22%)

Precipitation per hour once a year

|               | Current climate | G-scenario |     | W-scenario |      |
|---------------|-----------------|------------|-----|------------|------|
| Province      | 14 mm           | 15 mm      |     | 17 mm      |      |
| Noord-Holland | € 210.000       | € 225.000  | +7% | € 250.000  | +19% |
| Zuid-Holland  | € 355.000       | € 375.000  | +6% | € 420.000  | +18% |
| Total         | € 565.000       | € 600.000  | +6% | € 670.000  | +19% |

Precipitation per hour once every 10 years

|               | Current climate | G-scenario  |      | W-scenario  |      |
|---------------|-----------------|-------------|------|-------------|------|
| Province      | 27 mm           | 30 mm       |      | 33 mm       |      |
| Noord-Holland | € 375.000       | € 410.000   | + 9% | € 445.000   | +19% |
| Zuid-Holland  | € 640.000       | € 705.000   | +10% | € 770.000   | +20% |
| Total         | € 1.015.000     | € 1.115.000 | +10% | € 1.215.000 | +20% |

Precipitation per hour once every 100 years

|               | Current climate | G-scenario  |      | W-scenario  |      |
|---------------|-----------------|-------------|------|-------------|------|
| province      | 43 mm           | 48 mm       |      | 53 mm       |      |
| Noord-Holland | € 570.000       | € 630.000   | +11% | € 695.000   | +22% |
| Zuid-Holland  | € 990.000       | € 1.100.000 | +11% | € 1.210.000 | +20% |
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## Conclusions

- The claims frequency on private household and private home insurance is related to the intensity of the precipitation.
- Significant differences per province
- Based on scenarios, expectations are that the insured loss will increase by 6 – 22% in 2050

Questions?