4th International Symposium on Flood Defence
May 6 – 8, 2008
Toronto

waterschap Hollandse Delta

Urban Flood Management in The Netherlands

case Dordrecht

Hans Waals
Water Board Hollandse Delta

Ellen Kelder, Judith Bax
City of Dordrecht

Outline of the presentation

- **Historic overview of the Dutch situation**
  - ***the past***
  - ***the present***
  - ***the future***
- **Project ‘Urban Flood Management’ in Dordrecht**
- **Results and conclusions**

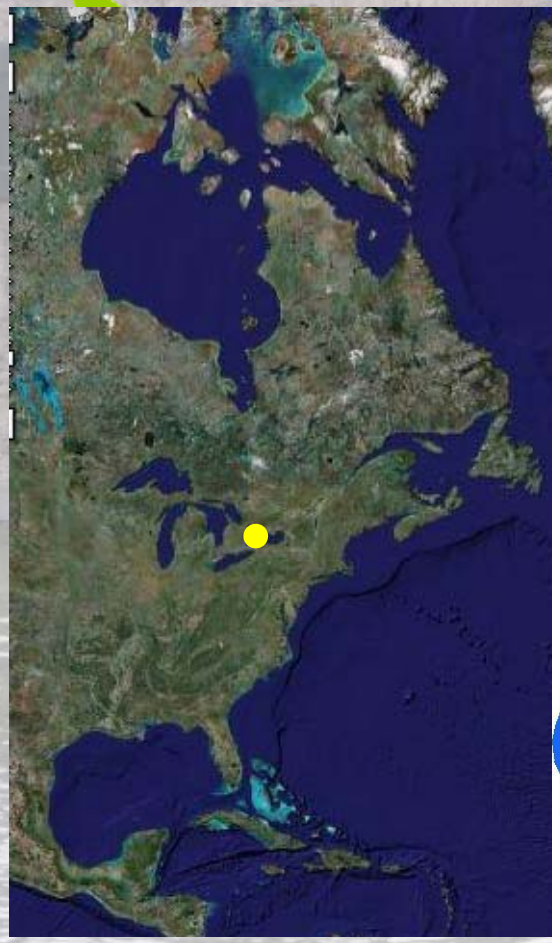
Historic overview: the past

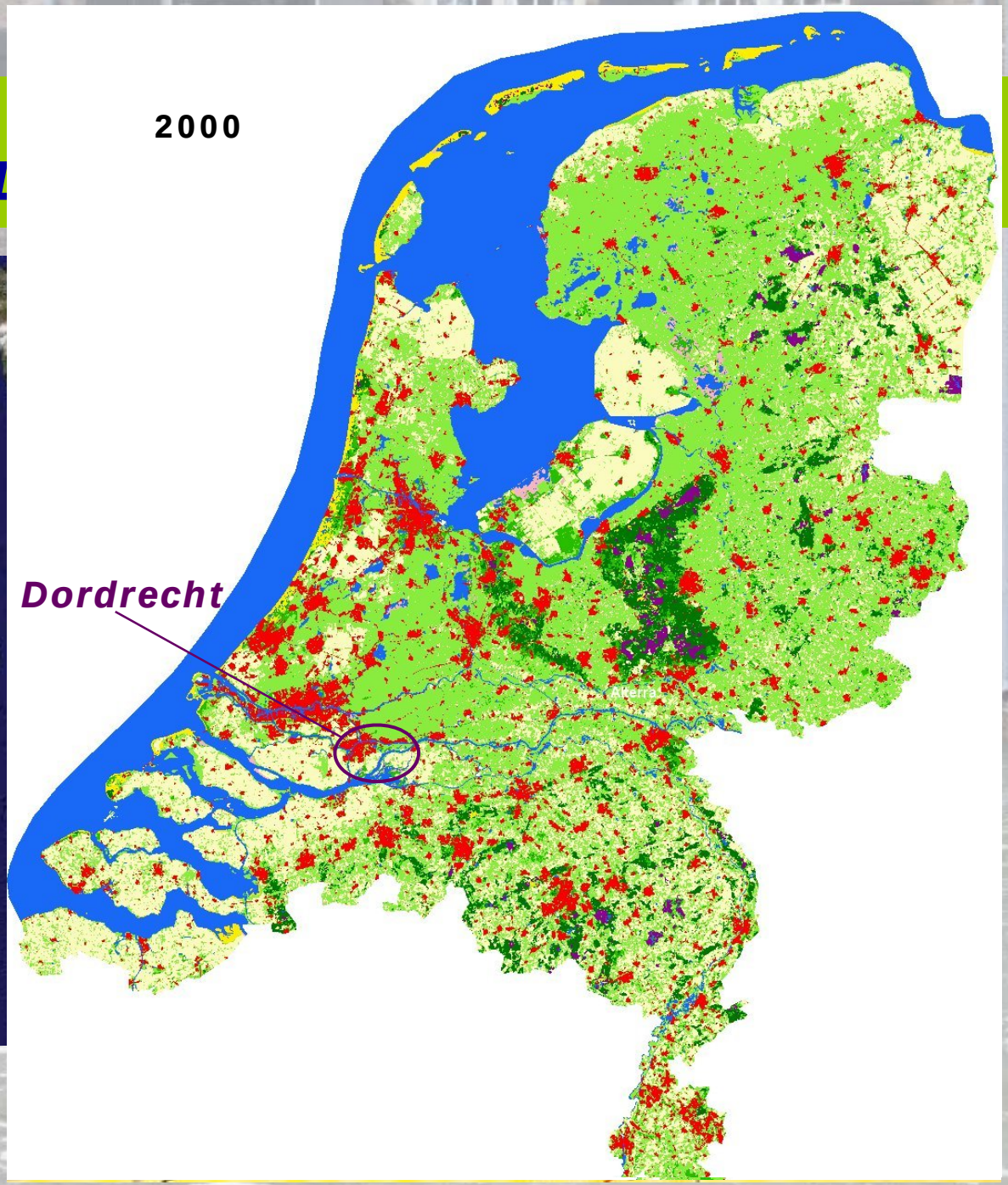
- Water brought prosperity and disaster

- Water management has always been part of the Dutch heritage

$$risk = probability * \frac{exposure * vulnerability}{resilience}$$

God
the L





Historic overview: the past

- **Flood defence**
  - **building on mounds**

resilience

  - **behind dikes and dunes**

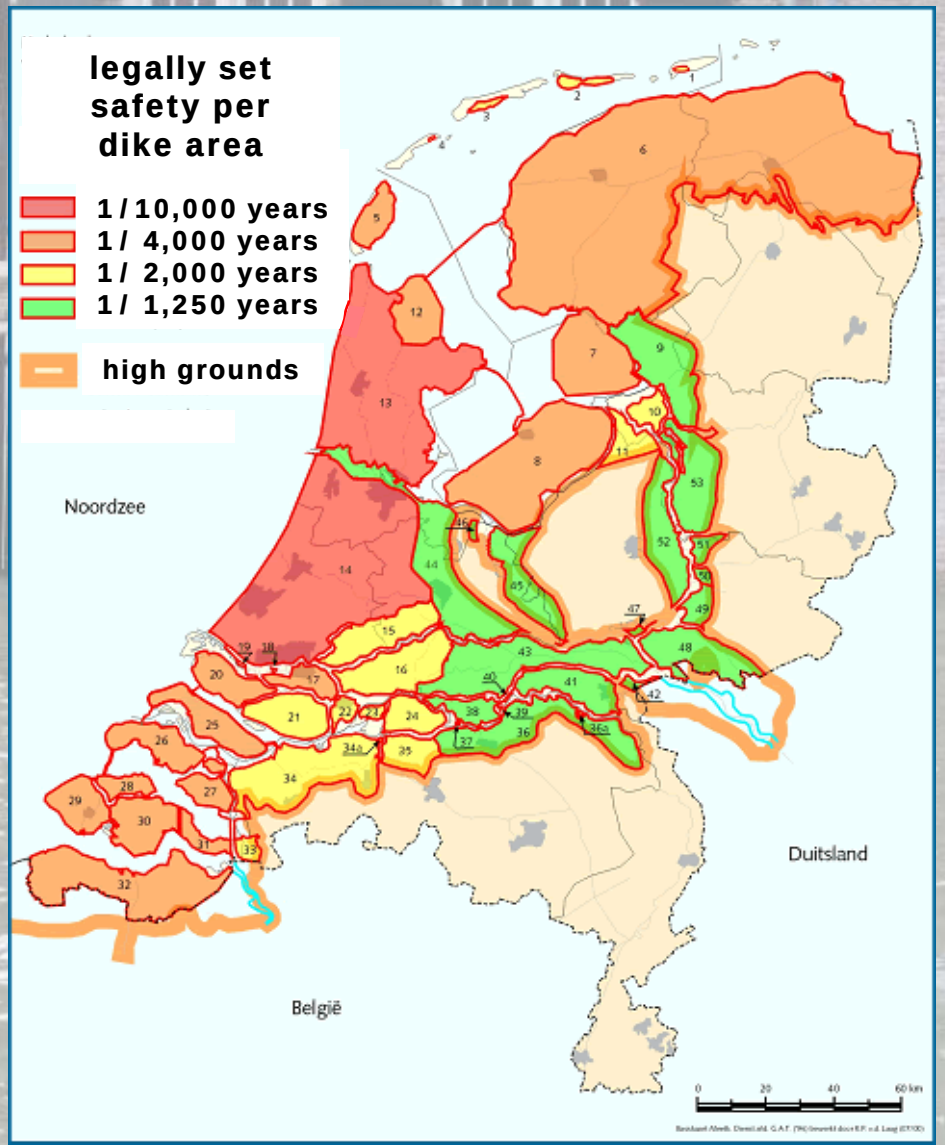
exposure

  - **special constructions**

vulnerability

Historic overview: the present

- Starts with the first Delta Commission
- Law on Flood Defence
- Aiming at the probability

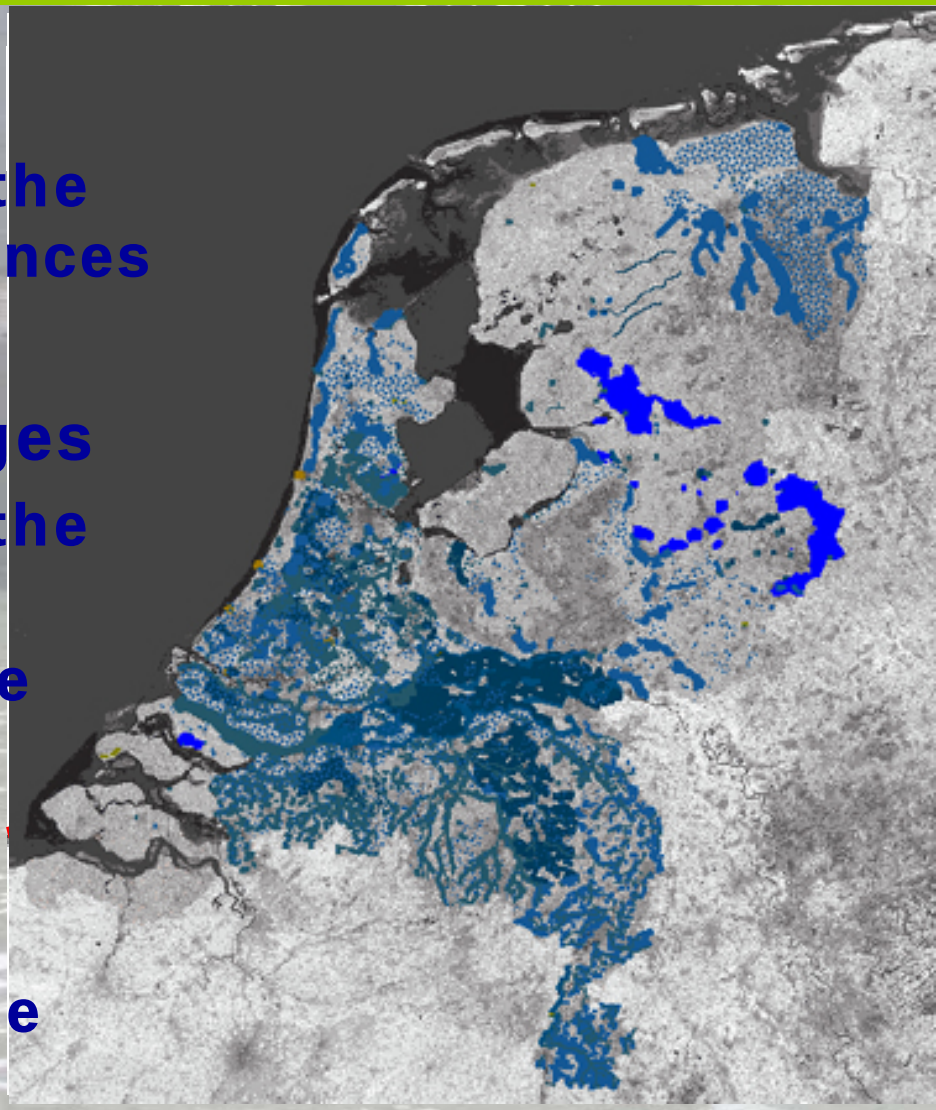


Climate change: increasing the probability

- Storm surges from the sea
- High discharges from Rhine and Meuse
- Pluvial flooding

Present policy: lowering the probability

- **Storm surges**
  - strengthen the coastal defences
- **High discharges**
  - strengthen the dikes
  - Room for the River
- **Pluvial floods**
  - more storage



Historic overview: the future

- **Climate change**
  - summer become drier
  - winters will be wetter
  - more intense rainshowers
  - result: higher discharges of the rivers
- **Sea level rising**
  - ~ + 1 metre in 2100
  - 3 – 8 metres in 3000
- **Increasing urbanisation**

Changing from probability to risk assessment

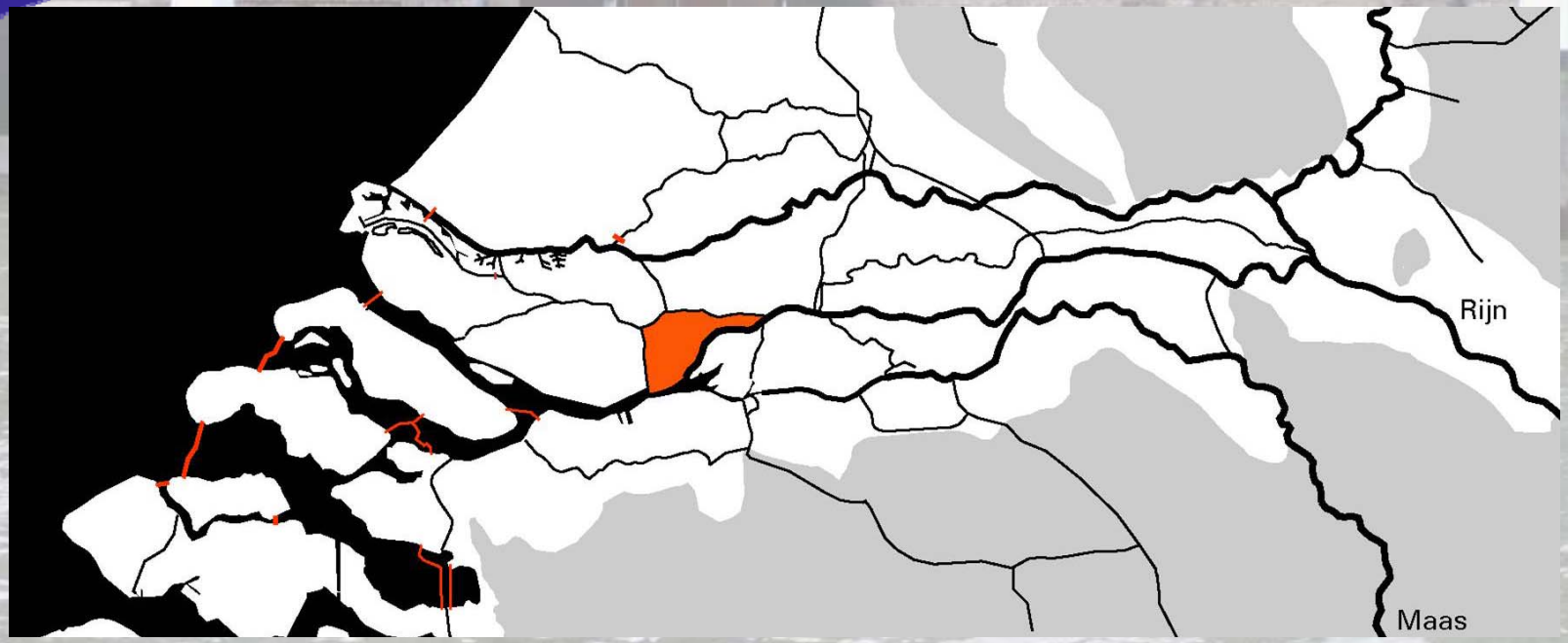
Outline of the presentation

- Historic overview of the Dutch situation
  - *the past*
  - *the present*
  - *the future*
- **Project 'Urban Flood Management' in Dordrecht**
- Results and conclusions

The city of Dordrecht

waterschap Hollandse Delta

- oldest town of Holland
- amidst the rivers and the sea
- brought prosperity and disaster



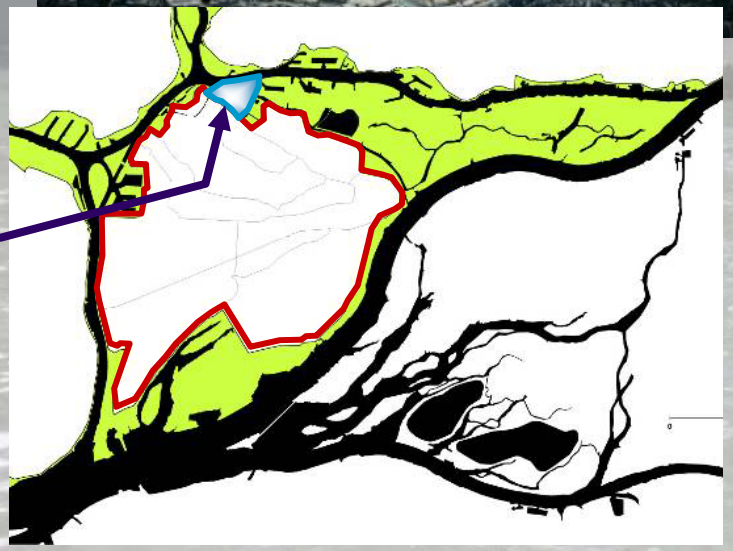
The city of Dordrecht

- dikes designed for a 2,000 year flood
- ground level behind the dikes between 0 and 2 metres below sea level
- ground level outside the primary defences 2 – 4 metres above sea level

Project: Urban Flood Management

- Together with London and Hamburg

- Aiming at Stadswerven



Project: UFM (2)

- redevelopment of industrial area
- creating flood safe housing area
- bridging the area with the historical town centre

UFM: Flood Risks

blue: situation nowadays

red: situation in 2100
with climate change and
sea level rising

flood level once in 2,000 years

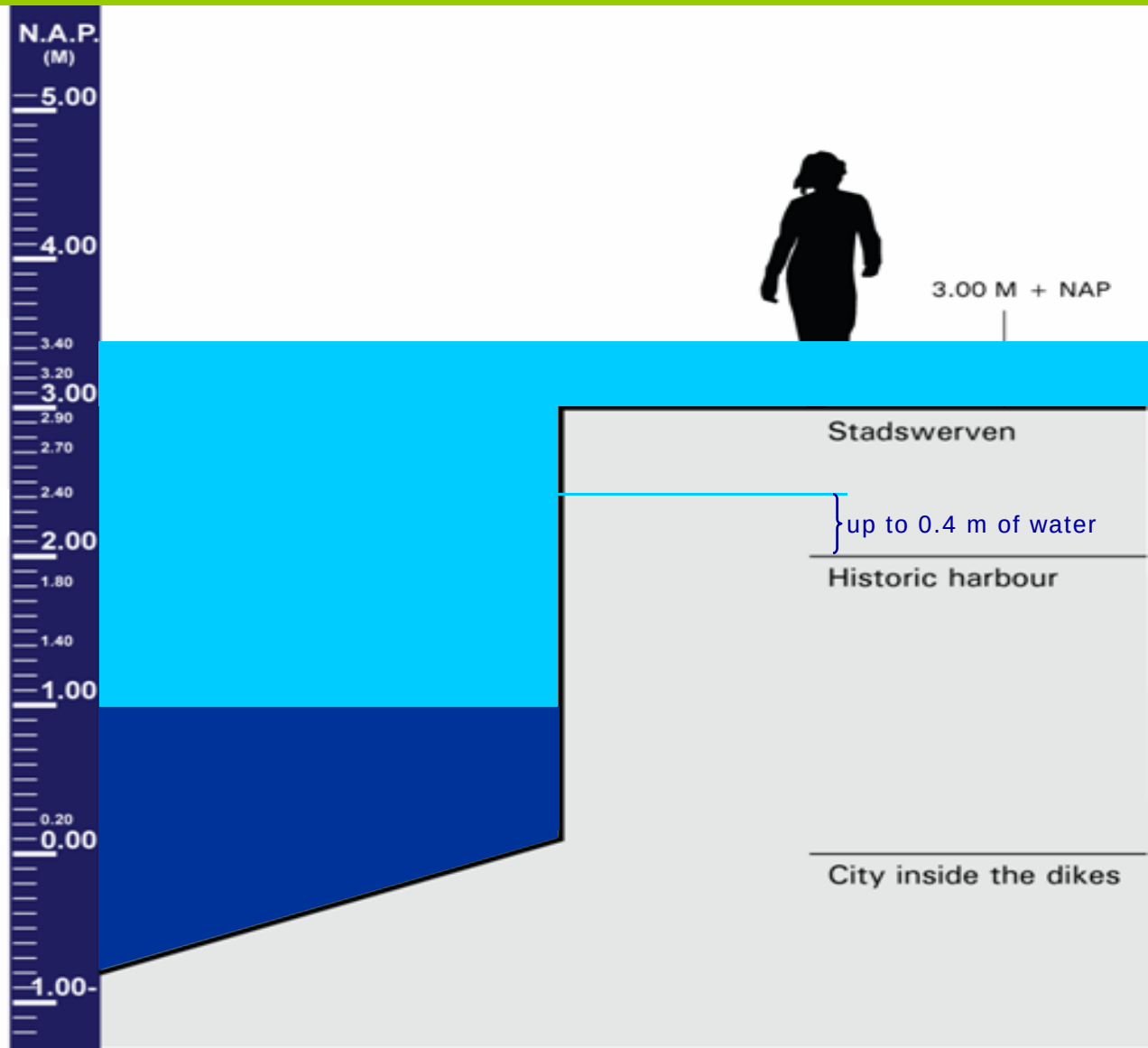
flood level once in 2,000 years
= flood level once in 100 years

flood level once a year

average high tide

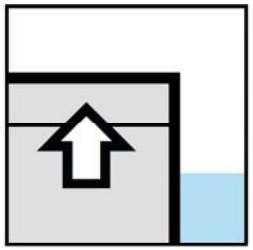
average high tide

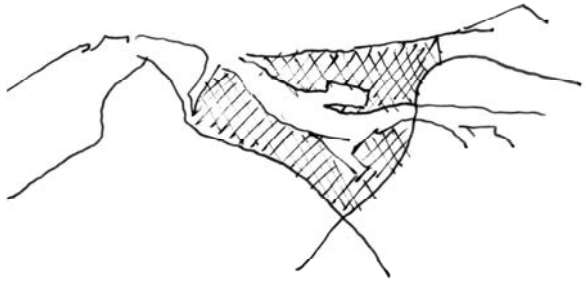
average low tide



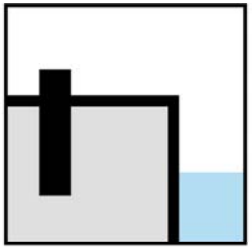
UFM: Development schemes

- **Mound**

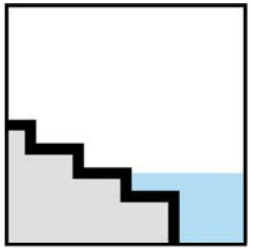


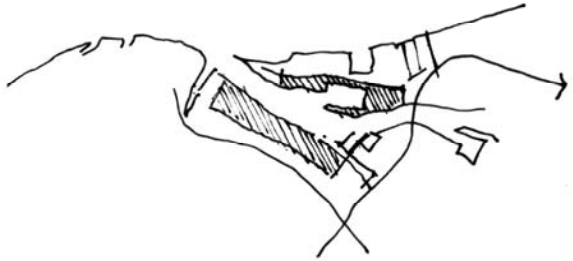


- **Flood fronts**



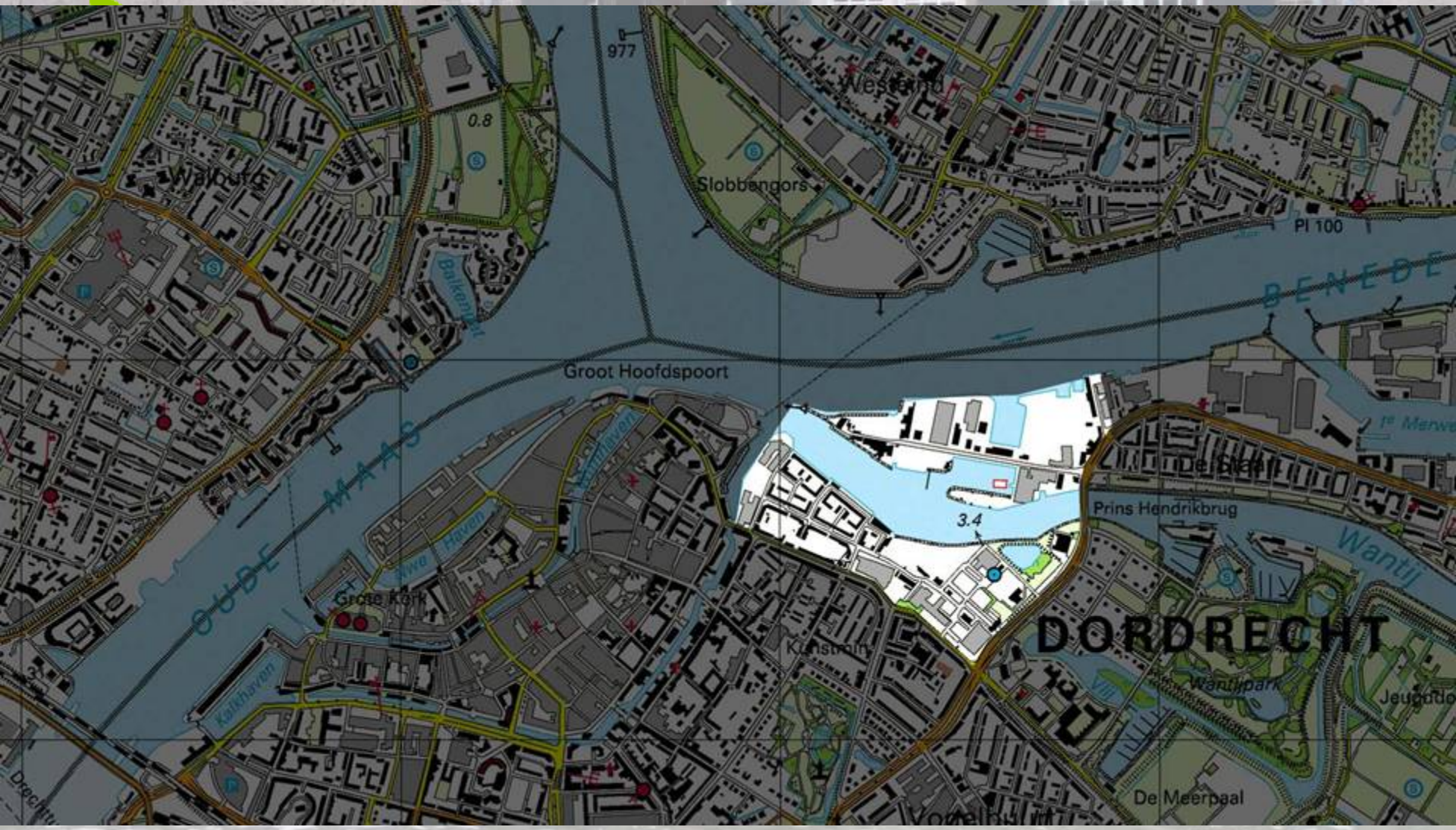
- **Terraces**



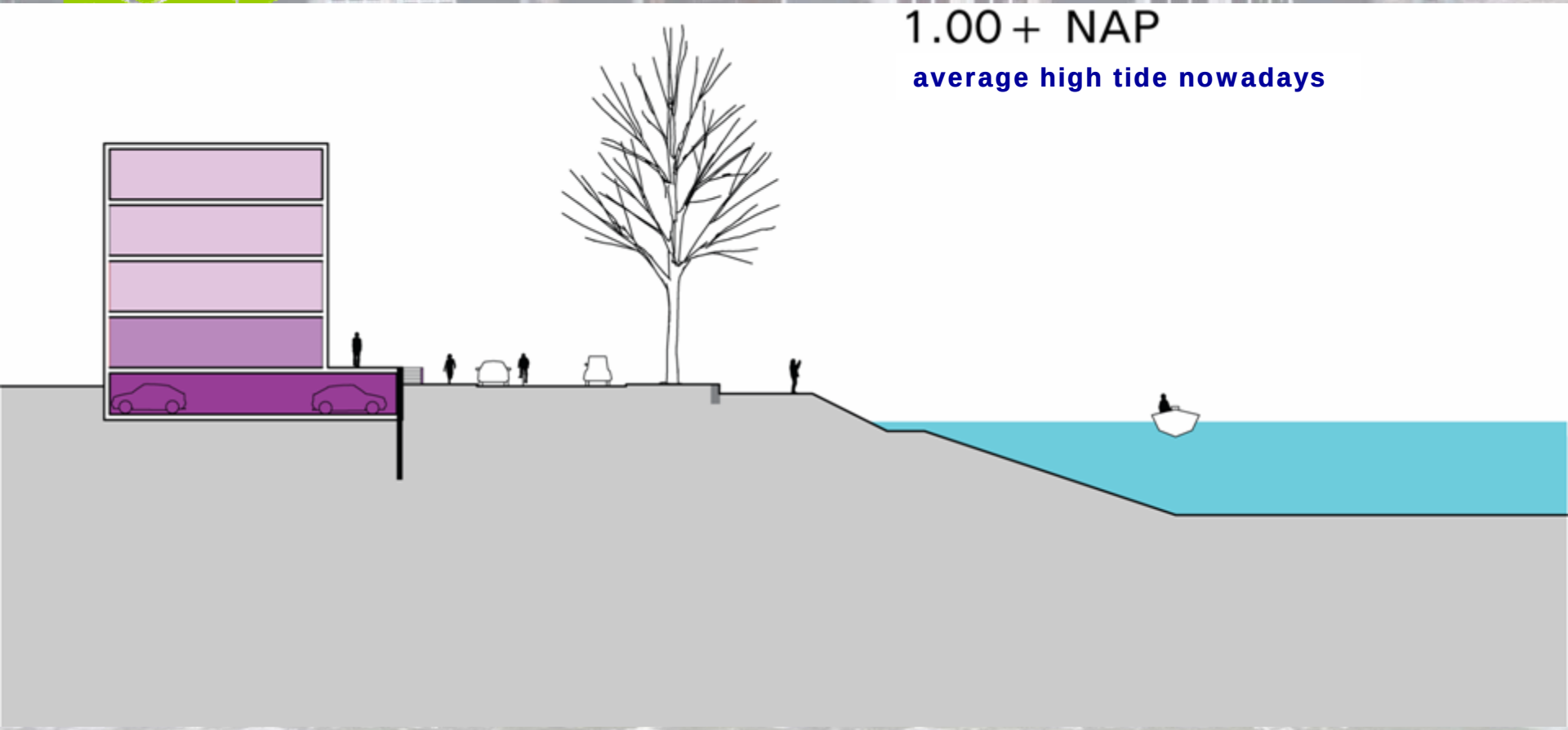


Mound:

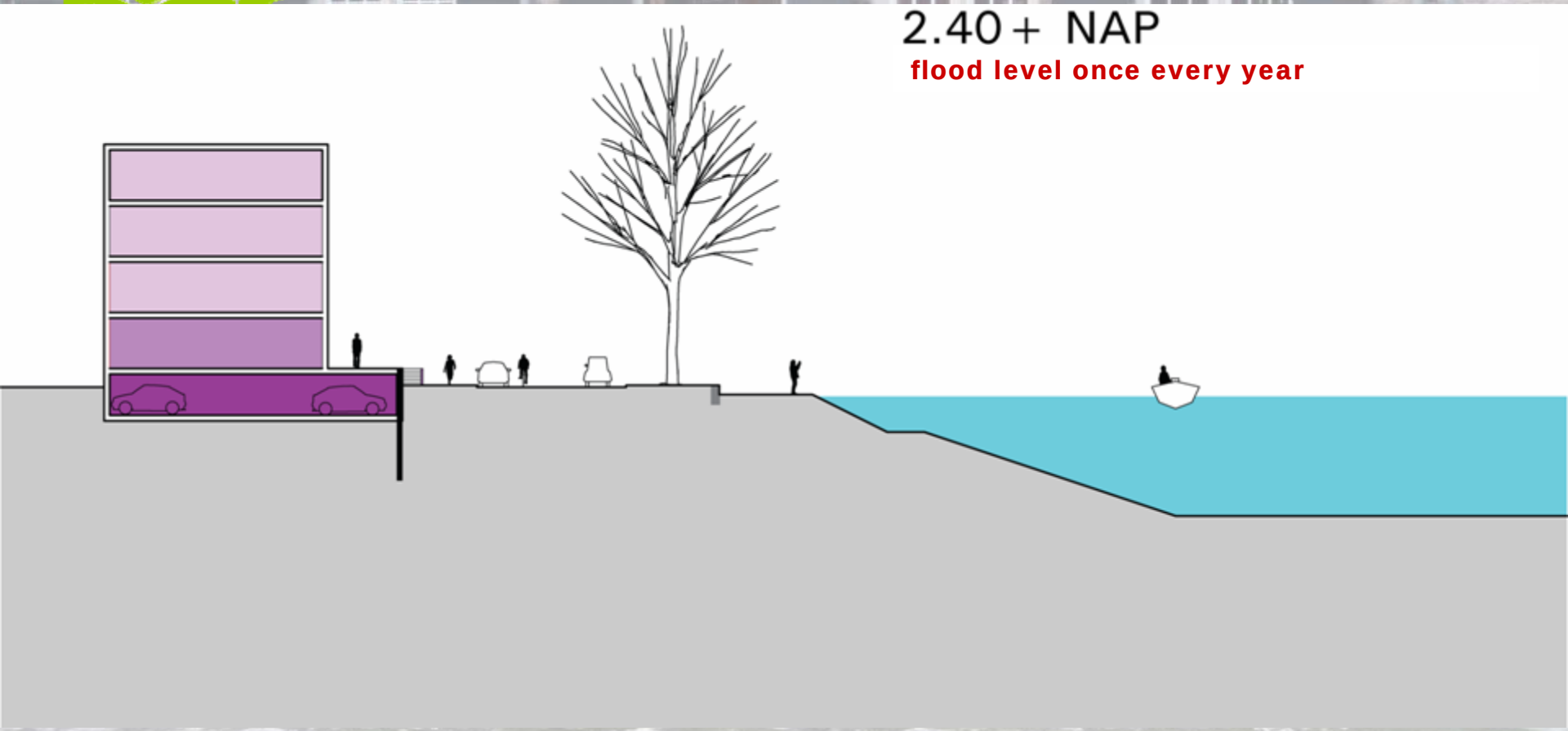
raise area to a safe level of 4 metres



Flood Fronts: normal situation



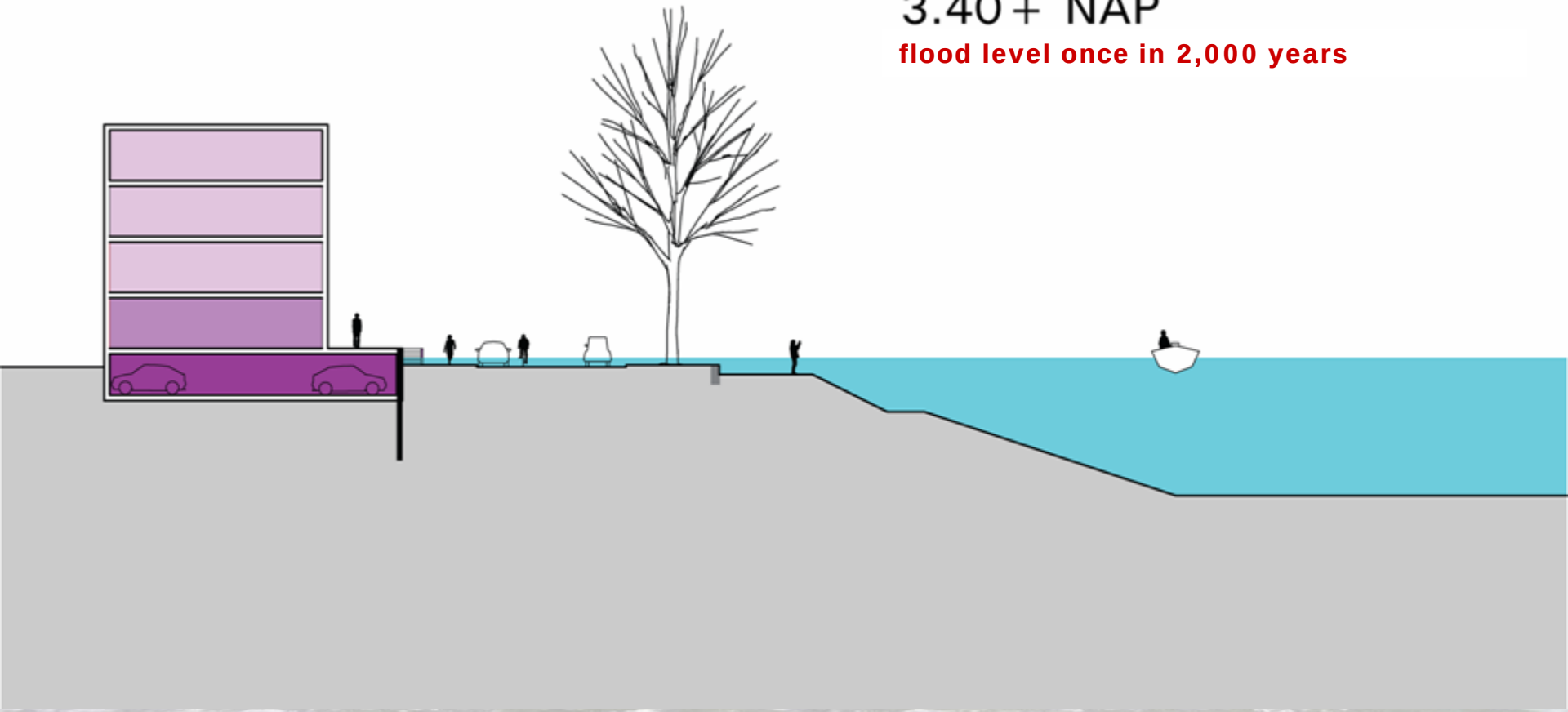
Flood Fronts: with climate change



Flood Fronts: extreme situation

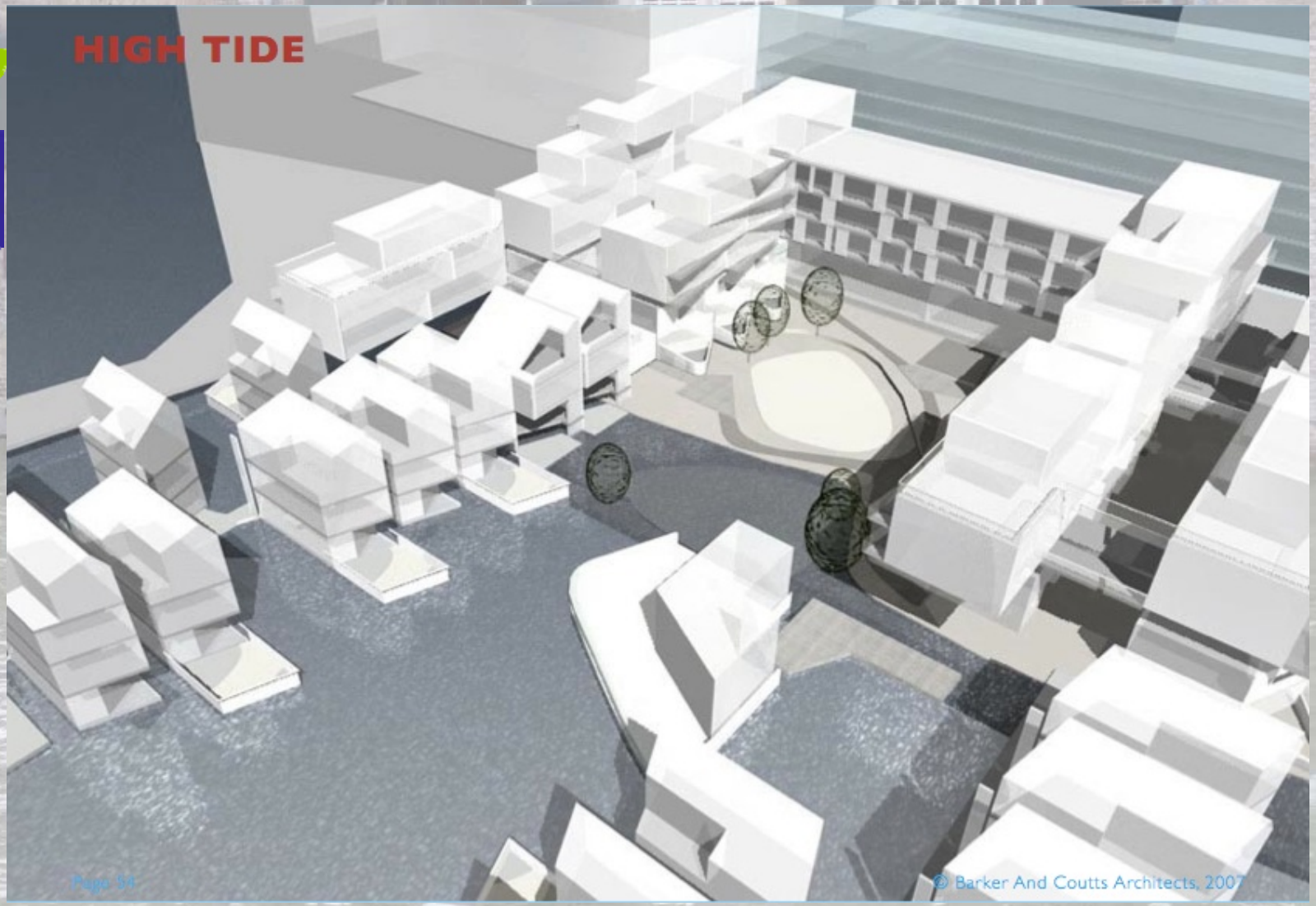
3.40 + NAP

flood level once in 2,000 years

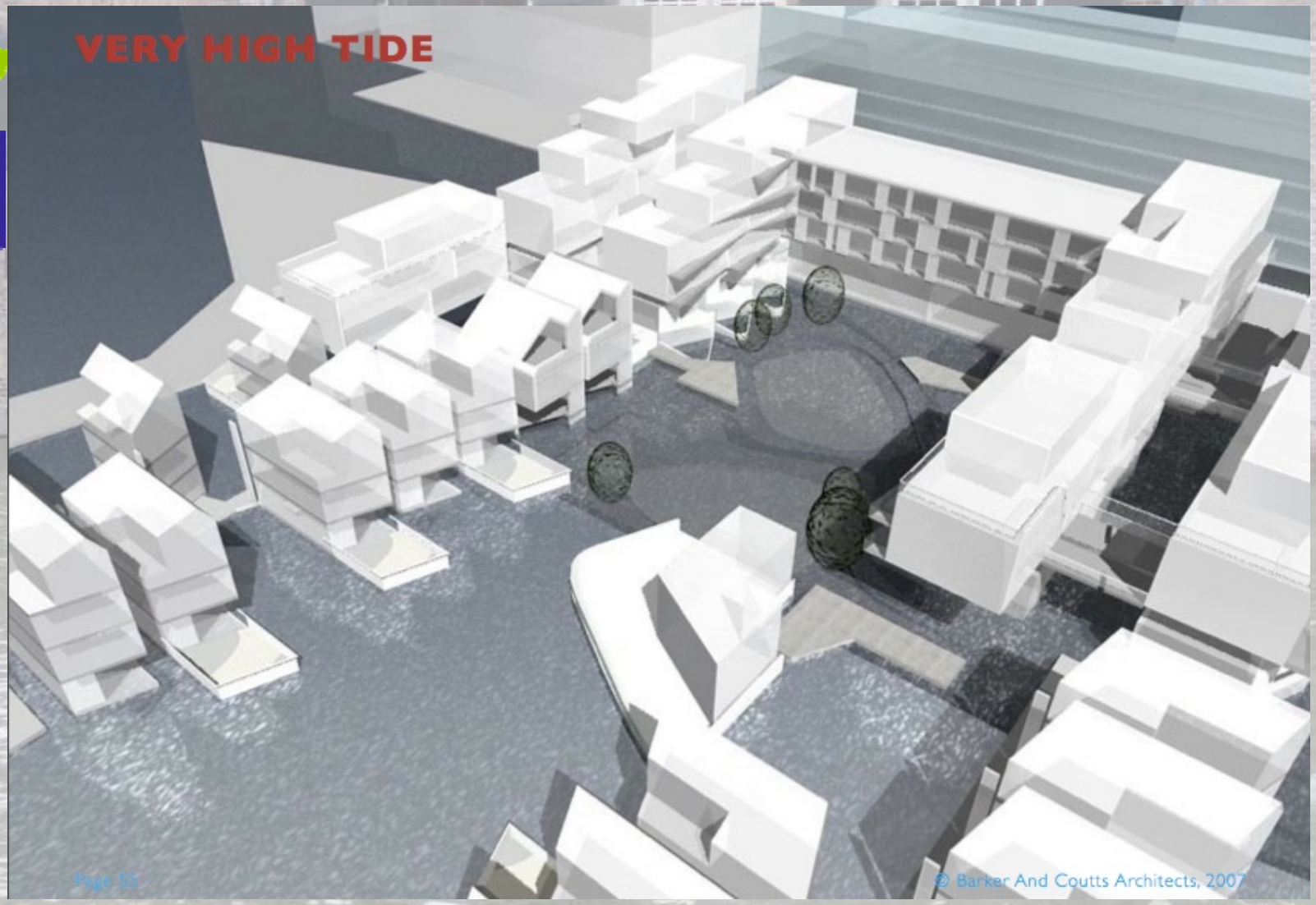


Terraces: Normal tide

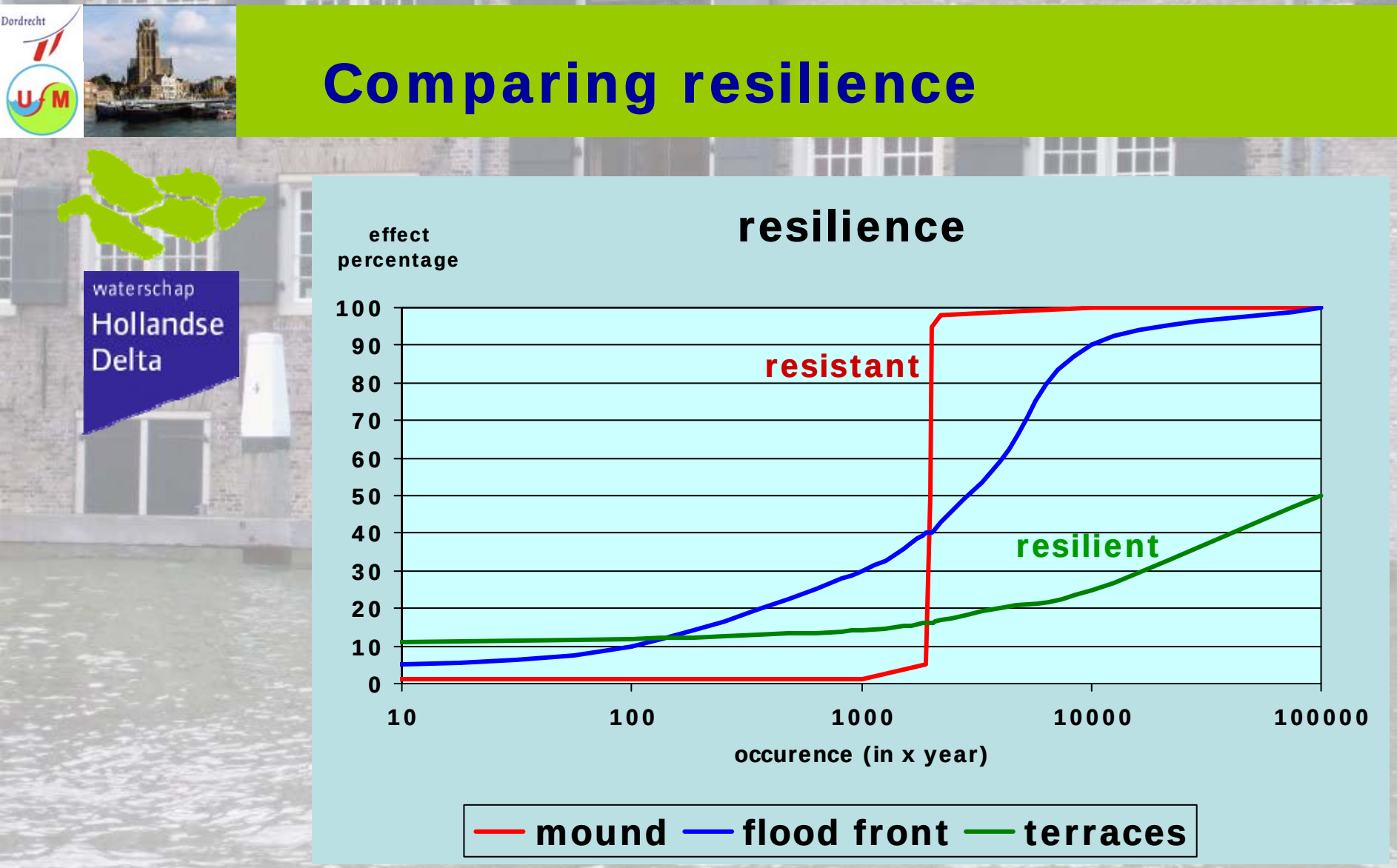
Terraces: High Tide



Terraces: Very high tide



Comparing resilience

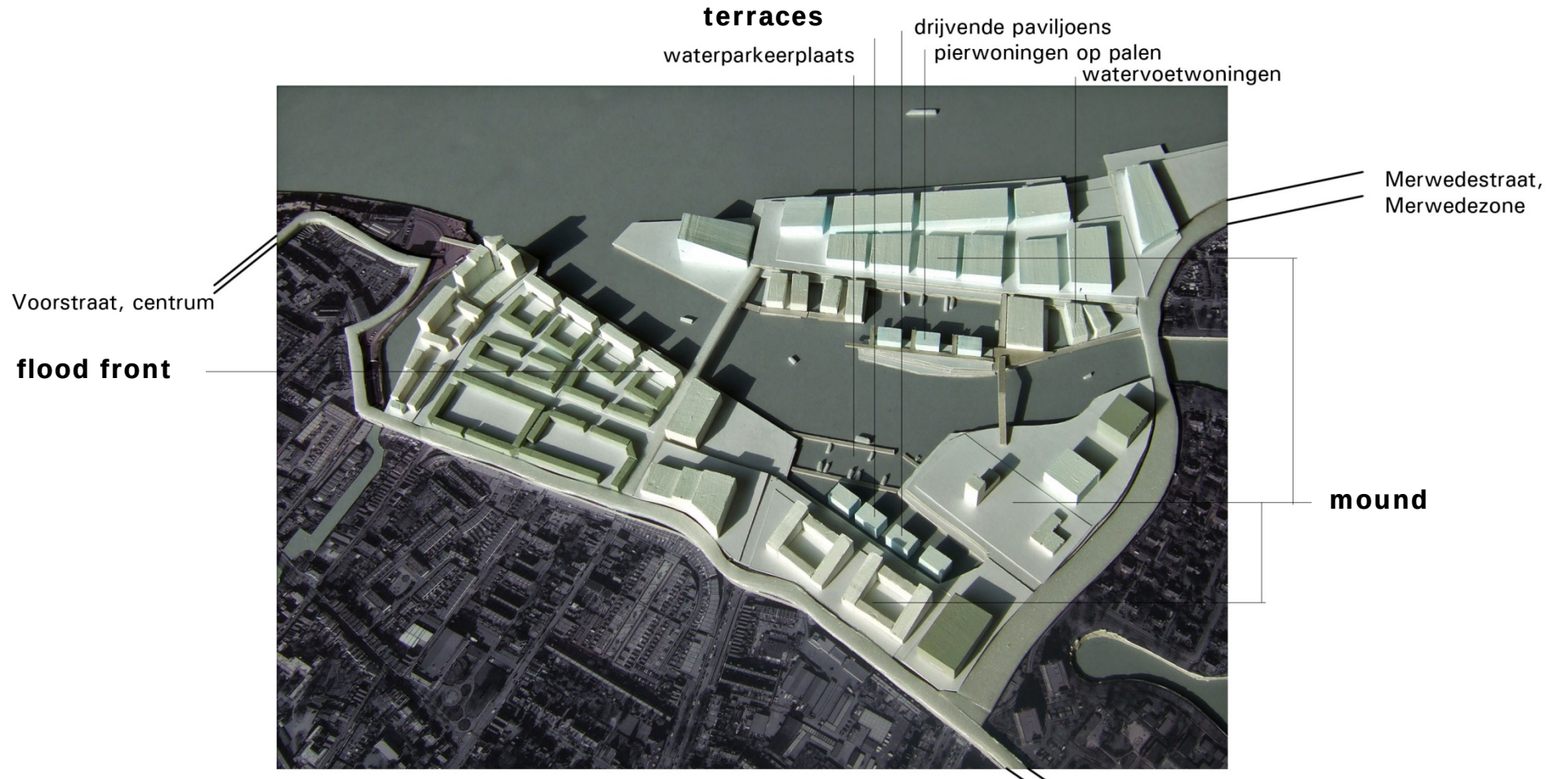


Outline of the presentation

- Historic overview of the Dutch situation
  - *the past*
  - *the present*
  - *the future*
- Project ‘Urban Flood Management’ in Dordrecht
- **Results and conclusions**

Results

- **New actual development plan**



Results (2)

- ‘Municipality and water board establish the level of water safety
- Private parties choose for the challenge
- They become ‘symbols’ and ‘heroes’ for resilient societies

$$risk = probability * \frac{exposure * vulnerability}{resilience}$$

Conclusions

- **Urban flood management in the next century means cooperation between:**
  - ***spatial planners & urban developpers***
  - ***water specialists***
  - ***policy makers***
  - ***building companies***
  - ***communication experts***

- **‘Living with water’ in stead of ‘ultimate protection’**

- **Bring back the resilient societies**


Dordrecht
U M
waterschap
Hollandse
Delta
thank you for your attention