UNESCO-IHE
Institute for Water Education

Perspectives from Europe

Climate change, planning, and floods

Chris Zevenbergen

FLOODRESILIENCEGROUP

TU Delft
UNESCO-IHE

UFM
COST C22

Contents

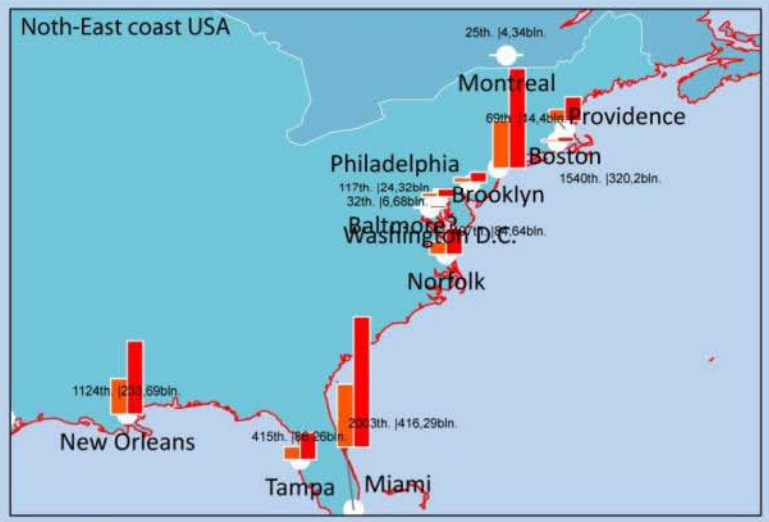
- What is at stake ?
- Options for the future
- First examples
- Conclusions

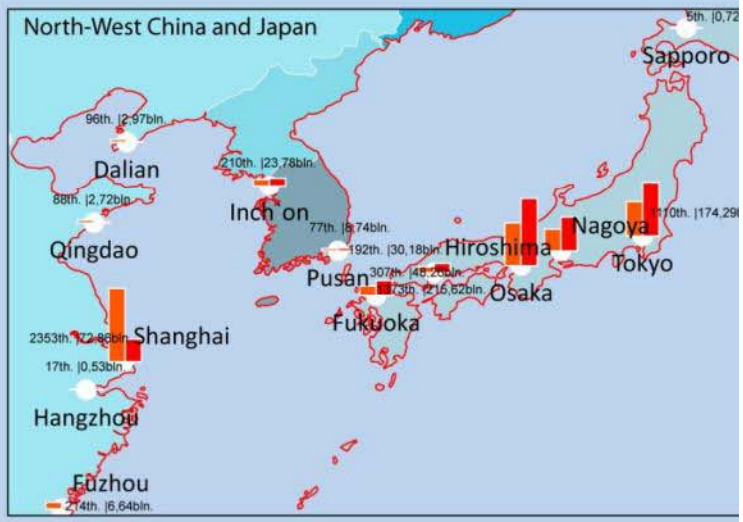
What is at stake world-wide ?

- Floods are on the rise (damage: 5% increase annually)
- Number of big flood disasters are increasing
- Only 5 percent of new development ‘under way’ in the world’s expanding cities is planned (UN, 2007).
- Spatial distributions by and large ignore flood risk
- Climate change: incentive to reconsider current flood management approaches (role of planning)

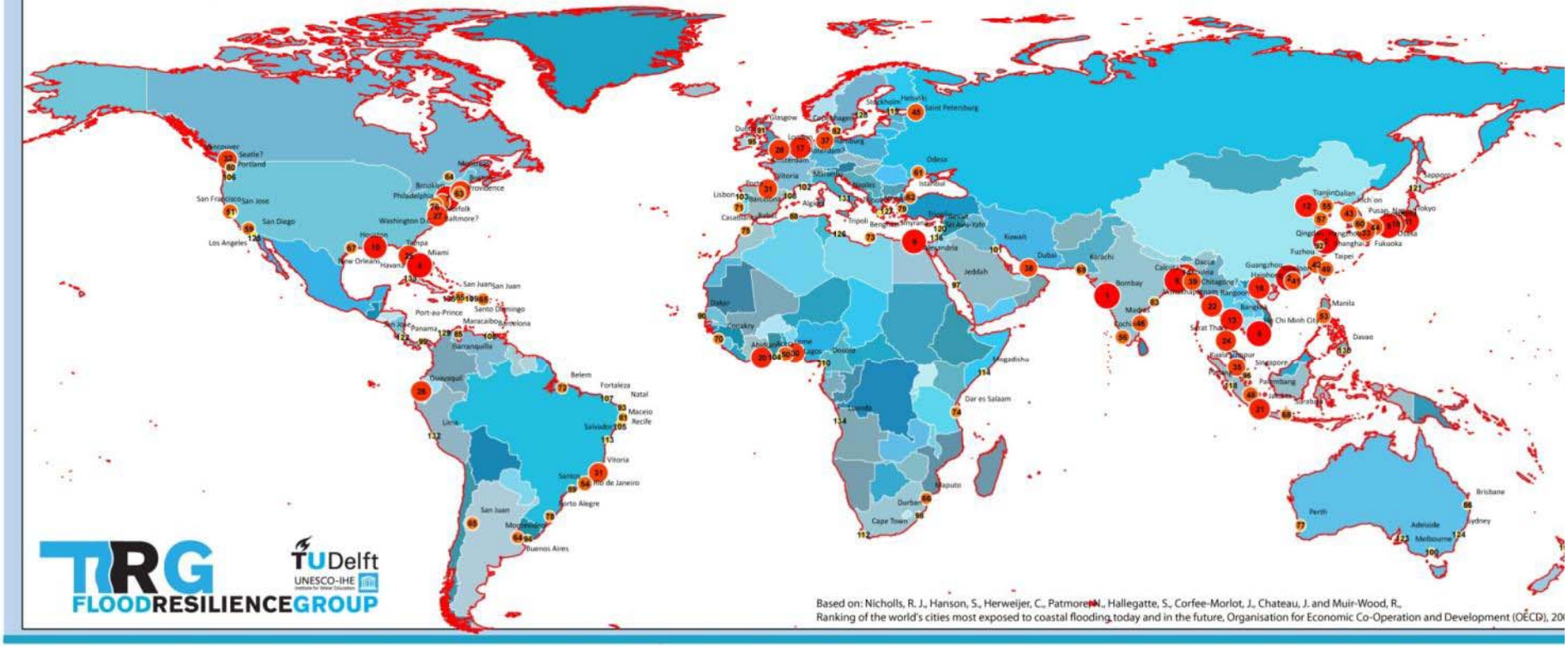
TOP 20 of most vulnerabile cities 2005

	exposed pop(th.)	exposed assets (bln.)
1.Mumbai (Bombay)	2.787	2.787
2.Guangzhou	2.718	2.718
3. Shanghai	2.353	2.353
4. Miami	2.003	2.003
5. Ho Chi Minh City	1.931	1.931
6. Calcutta	1.929	1.929
7. New York-Newark	1.540	1.540
8. Osaka-Kobe	1.373	1.373
9. Alexandria	1.330	1.330
10.New Orleans	1.124	1.124
11.Tokyo	1.110	1.110
12.Tianjin	956	956
13.Bangkok	907	907
14.Dhaka	844	844
15.Amsterdam	839	839
16.Hai Phòng	794	794
17.Rotterdam	752	752
18.Shenzen	701	701
19.Nagoya	696	696
20.Abidjan	519	519





Ranking of top 130 cities exposed to coastal flooding in 2005



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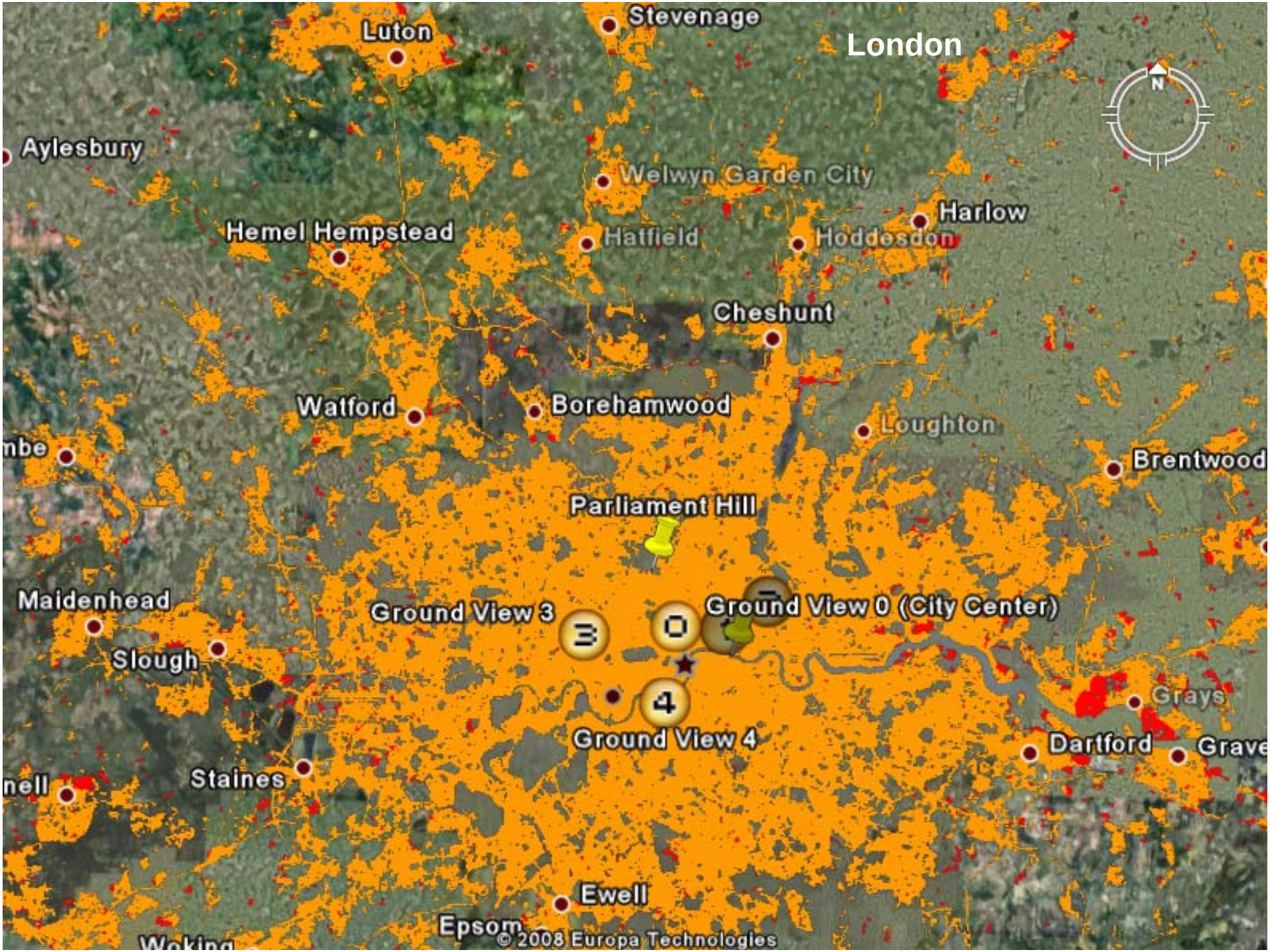
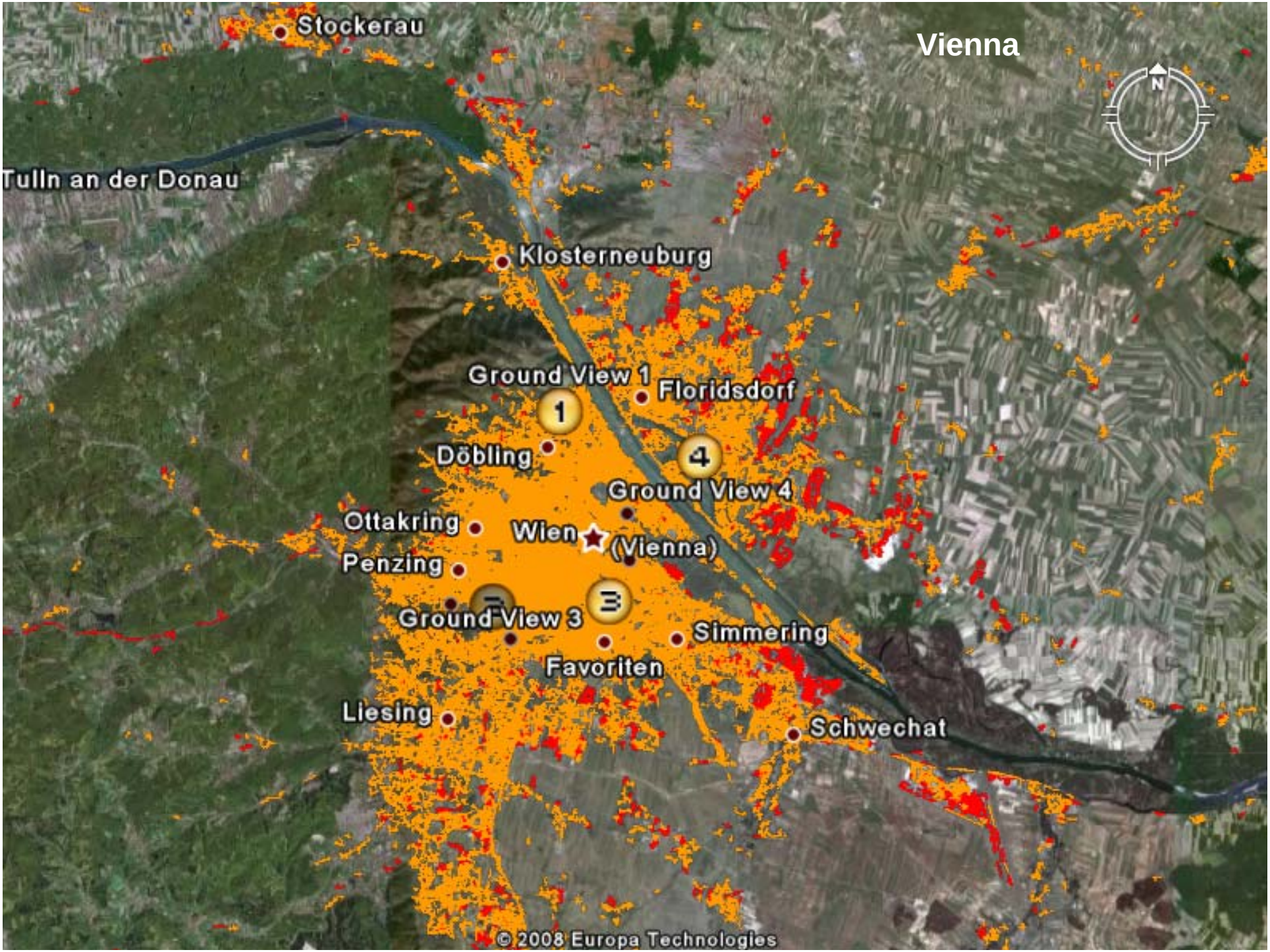
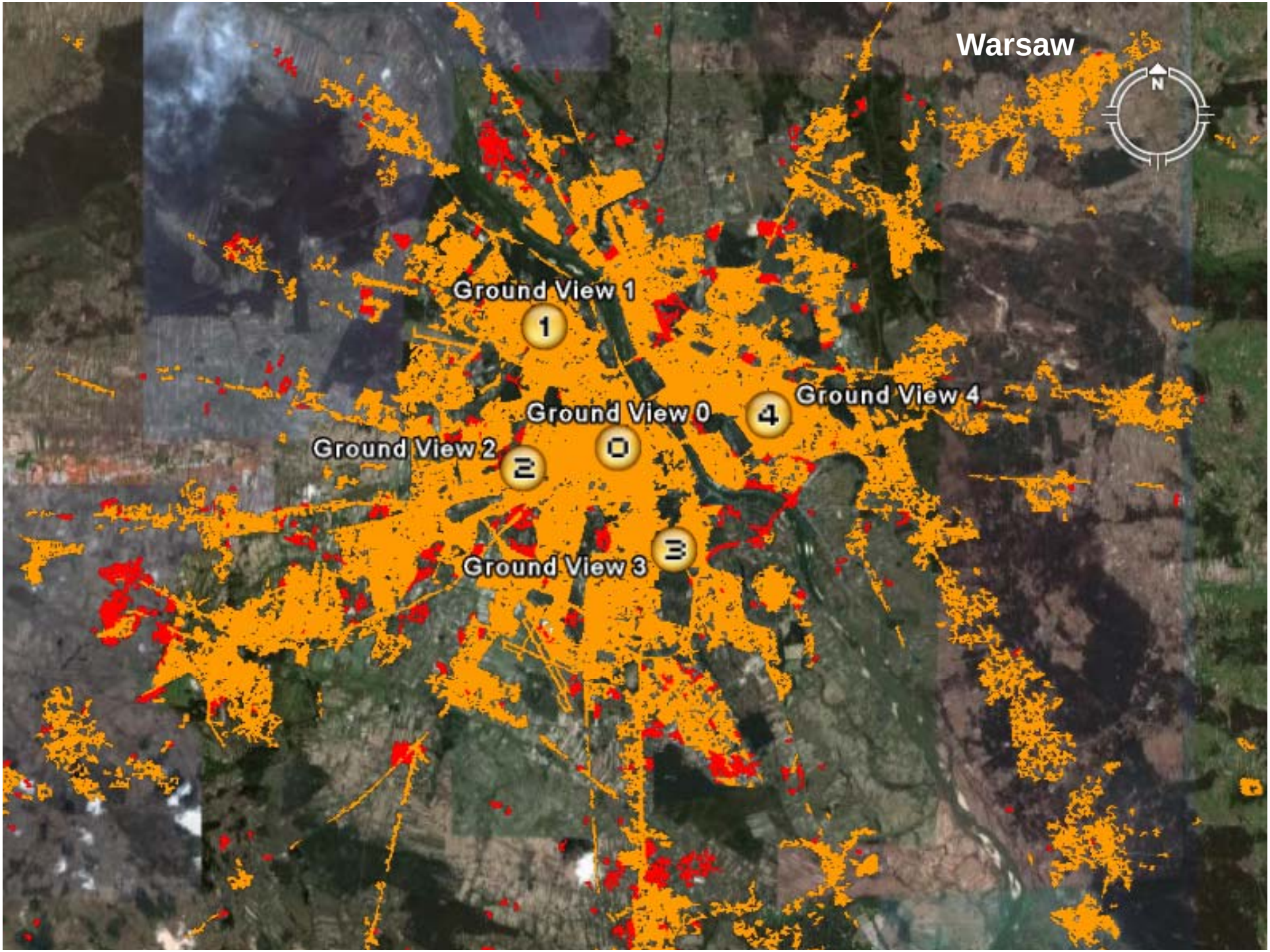
Based on: Nicholls, R. J., Hanson, S., Herweijer, C., Patmore, N., Hallegatte, S., Corfee-Morlot, J., Chateau, J. and Muir-Wood, R., Ranking of the world's cities most exposed to coastal flooding today and in the future, Organisation for Economic Co-Operation and Development (OECD), 20

Europe
Facts&Trends

- 80% of the population will live in urban areas by 2020
- Building stock is aged and one third will be renewed by 2030
- Next 10 years 25 mln new dwellings
- Floods are on the rise!
- Spatial distributions by and large ignore flood risk


London
Stevenage
Luton
Aylesbury
Welwyn Garden City
Harlow
Hemel Hempstead
Hatfield
Hoddesdon
Cheshunt
Watford
Borehamwood
Loughton
Brentwood
Parliament Hill
Maidenhead
Ground View 3
Ground View 0 (City Center)
Slough
Grays
Ground View 4
Dartford
Staines
Ewell
Epsom
© 2008 Europa Technologies


Vienna
N
Stockerau
Tulln an der Donau
Klosterneuburg
Ground View 1
1
Floridsdorf
Döbling
4
Ground View 4
Ottakring
Wien
(Vienna)
Penzing
3
Ground View 3
Simmering
Favoriten
Liesing
Schwechat
© 2008 Europa Technologies


Warsaw
N
Ground View 1
1
Ground View 0
0
Ground View 2
2
Ground View 3
3
Ground View 4
4

Floods in Europe

- >75% flood damage in urban areas;

- Current policies (if any) are generally directed to reduce flood probabilities;

- Despite economic considerations decisions on flood risk management are driven by events;

- The protection level is not the result of an economic trade-off;

- Extreme events (e.g. overtopping) are not yet taken into account/systems are not designed for failure.

EU expenditures on floods

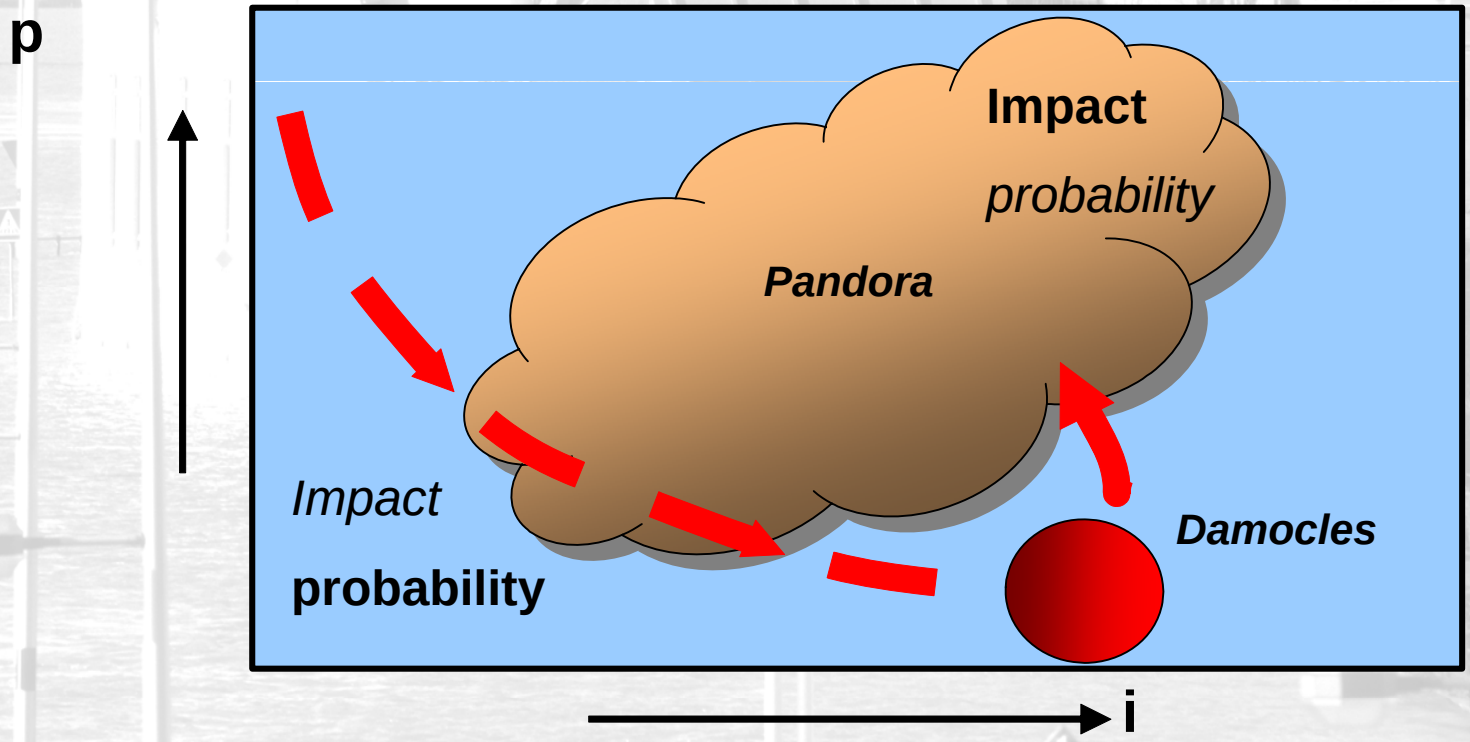
- > 40 bln Euros/year for flood repair/damage compensation and mitigation

- Over 3 bln Euros/year for flood protection

- 55 mln Euros/year on EU flood related research

Climate Change: increases uncertainty

Coping with uncertainty



Based op o.a. Renn (2002)

Climate Change is trend breaker

- No best solution
- Climate proofing strategies: manage future variability (and uncertainty) = **adaptation**:
  - robustness (surplus, worst-case, coping resilience, plan B);
  - flexibility (reversibility, adaptive resilience, no regret).
- Opportunities for innovation
- Huge potentials for the building industry

Need for change

- Increasing vulnerability and uncertainty
- Increasing complexity (and dynamics)

Old paradigms in flood management

- Changes in system are stable and predictable

- Control changes (problem solving)

- 20 to 50-yr planning timeframe

- Sequential process of planning (linear)

- Top down strategy making

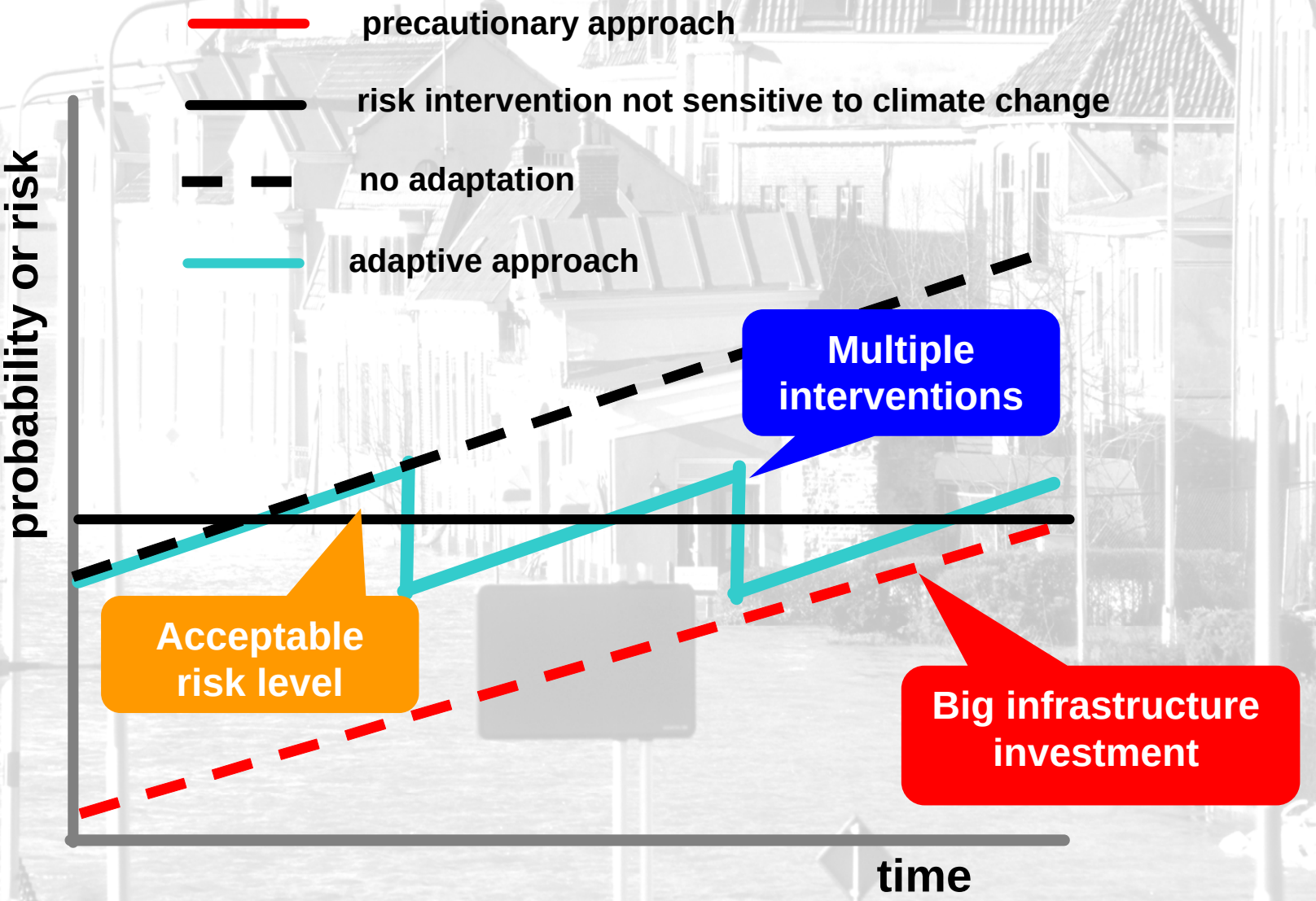
- Focus on probability reduction

- System of aims and static norms and standards

New paradigms in flood management

- Changes in system are uncertain
- Sustaining and enhancing capacity to adapt to uncertainties (anticipation)
- Long-term horizon (up to 100 yrs)
- Bottom-up initiatives and top-down strategic decisions
- Plan for less vulnerability key guiding principle
- System of strategic alternatives

Two approaches



Urbanisation

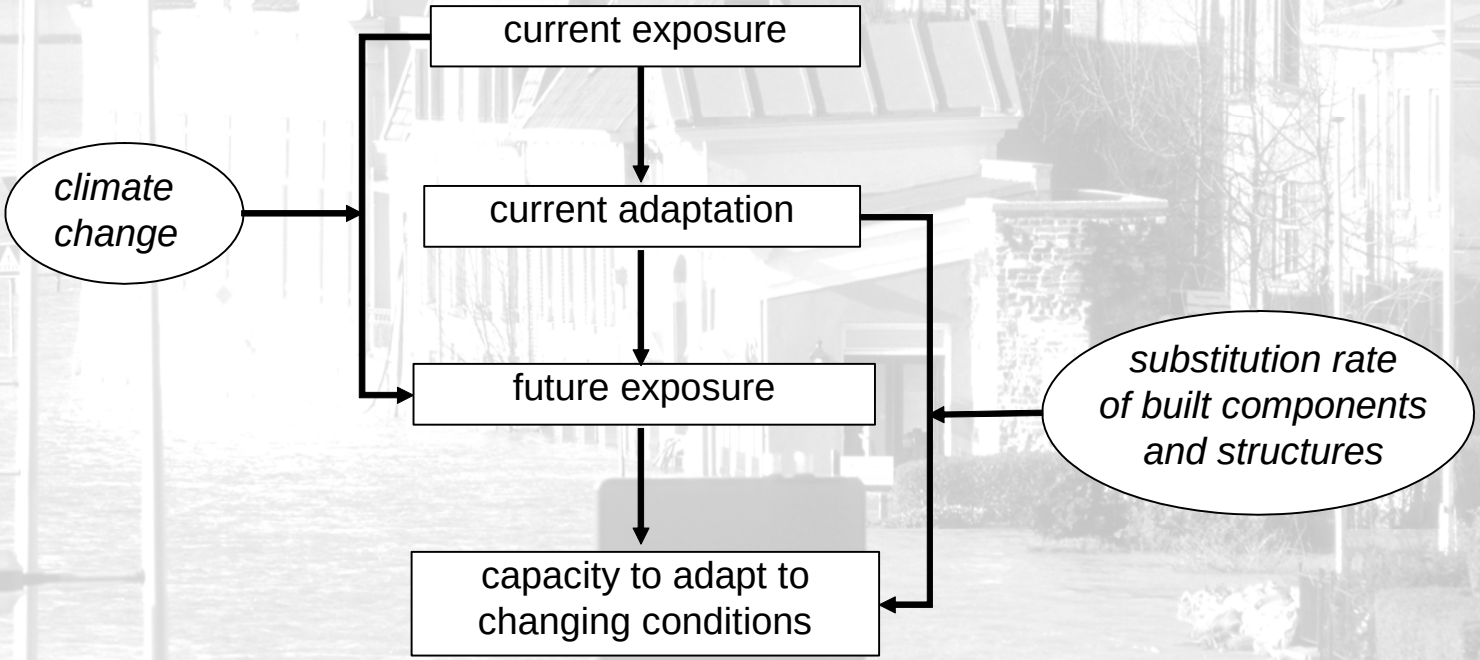
Current paradigm:

- **buildings last forever and ‘site or urban location is eternal’**
- **planning practices based upon static conditions of climate and building stock.**

New pradigm:

- **cities are dynamic complex systems: autonomeous/planned adaptation**
- **change and variability are characterized by uncertainty**

Climate adaptation and urban renewal (adaptive responses)



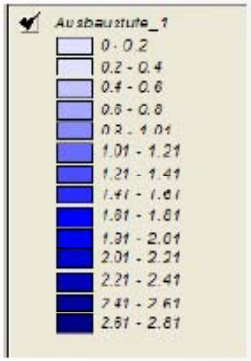

BINNENHAFEN
HARBURG
Hamburg
NEUE MITTE
WILHELMSBURG
Reiher Stieg
Grasbrook
HafenCity
MAGDEBURGER HAFEN
BINNENALSTER

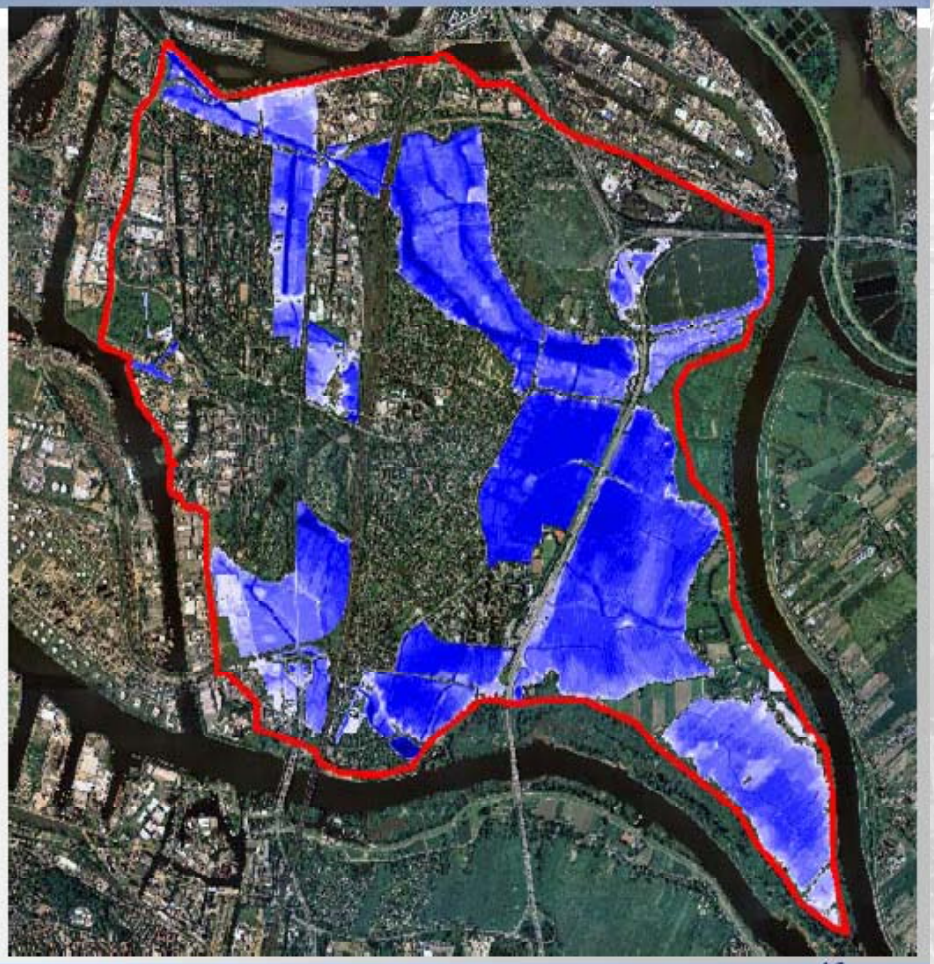
WASSERBAU River and Coastal Engineering

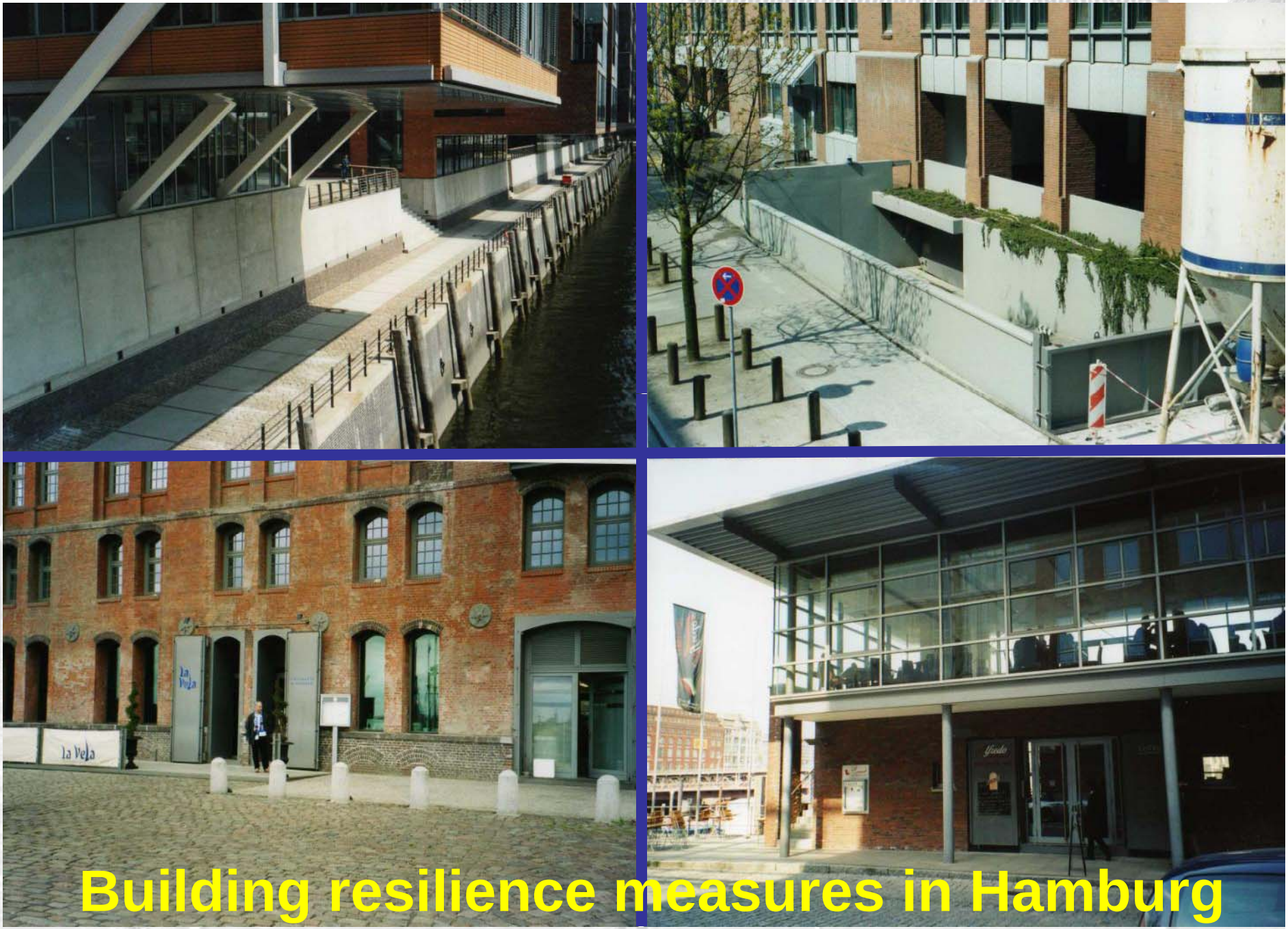
Application and Assessment of the CFC-method to City of Hamburg
Elbe-Island of Wilhelmsburg/Hamburg

Average water depth:
1,69 m

Total Storage capacity:
15,1 Mio m³







Building resilience measures in Hamburg


synergies/short term benefits

高規格堤防（スーパー堤防）特別区域

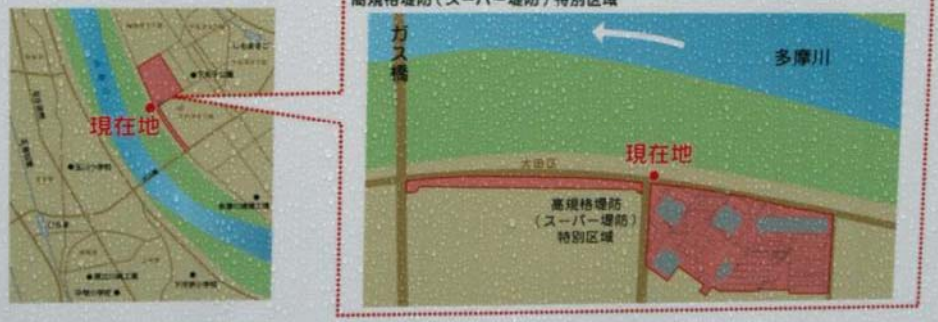
高規格堤防（スーパー堤防）とは

- 大都市地域の大洪水の氾濫に対する大切な備えです。
- 水と緑に恵まれた快適なまちをつくります。
- 土地をより有効に利用することができます。
- こわれない堤防で安全を確保します。
- 都市整備と一体となって進められる事業です。
- 多摩川においては、河口から、日野橋までが高規格堤防整備対象区間となっています。

高規格堤防（スーパー堤防）の構造

高規格堤防（スーパー堤防）特別区域とは

スーパー堤防が整備された後は、スーパー堤防部分は河川法上は「河川区域」になります。河川区域では基本的に建物を建てたり木を植えたりということは、規制されます。そこで、スーパー堤防の通常の土地利用に供する部分では、「高規格堤防特別区域」を設定して規制を緩和しています。「高規格堤防特別区域」では通常の土地利用ができるとともに、あらゆる災害に対して安全で安心できる土地になります。



高規格堤防（スーパー堤防）上の土地利用は

河川法（第26条）建築物等の新築・改築

基礎杭・電柱・その他棒状の工作物、地表から深さ1m以内の地下における新築または改築は許可を必要としません。

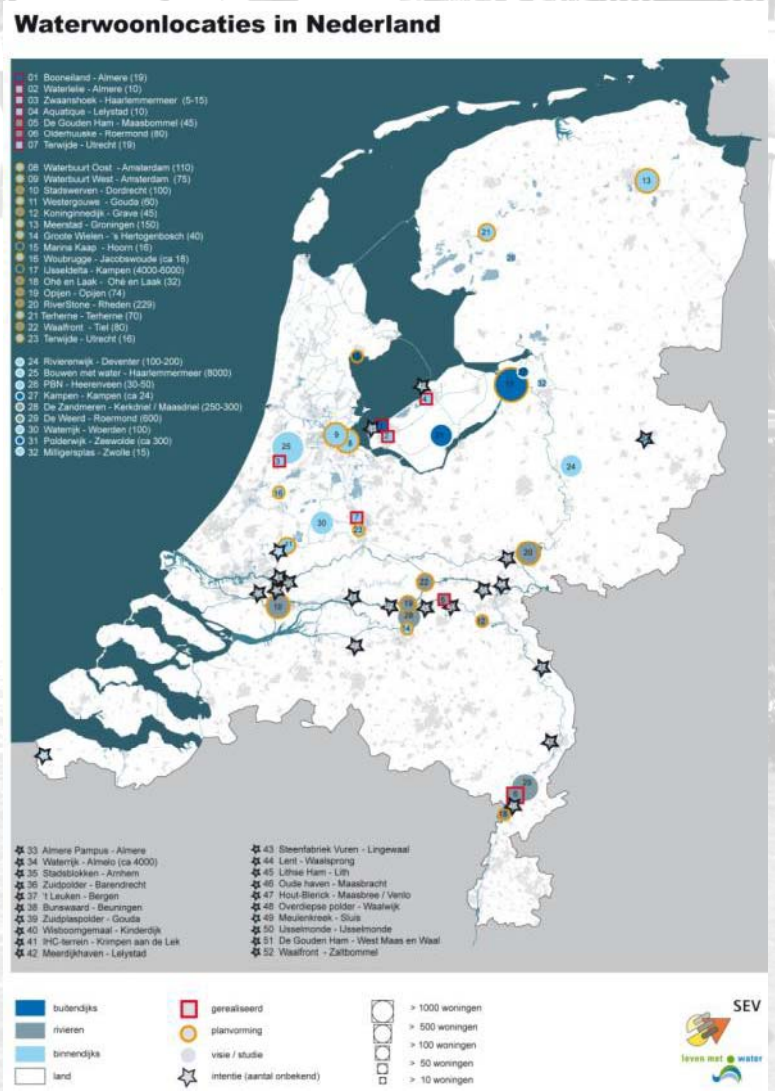
高規格堤防特別区域は家を建てたり、植物を植えたり、ふつうの土地利用ができます。

河川法（第27条）掘削又は切土

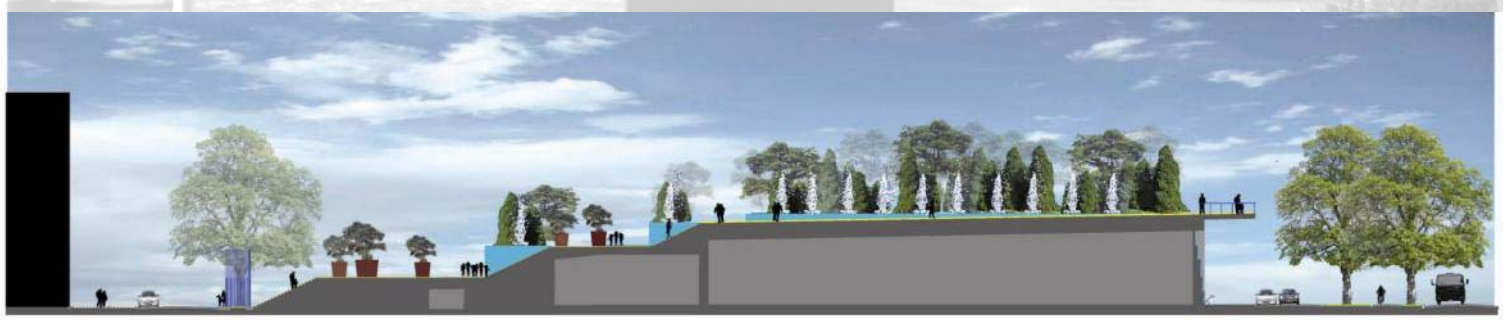
盛土や植栽、または地表から深さ1.5m以内の土地の掘削でただちに埋め戻す場合は許可を必要としません。

高規格堤防に関するお問い合わせ先：国土交通省関東地方整備局京浜河川事務所　TEL 045-503-4093

Experiments




NED
0555
2220
no mercy
NED
0555
2224
NED
0851
1290

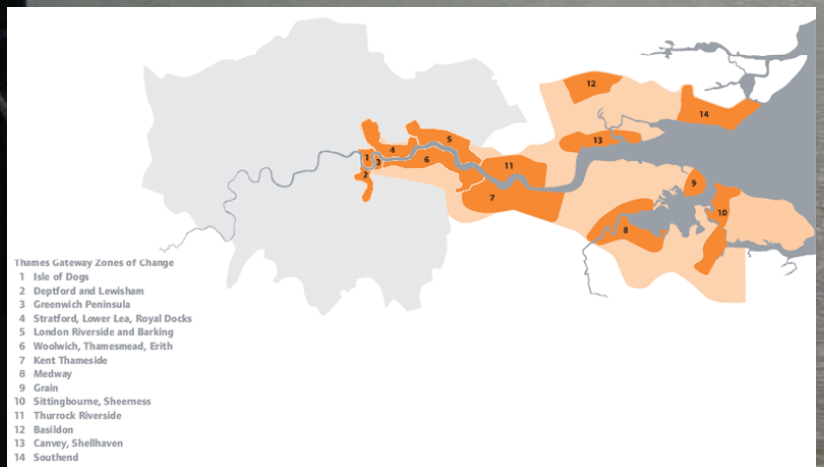



Dakpark


Referentie
BURO SANT EN CO landschapsarchitectuur

Thames Gateway

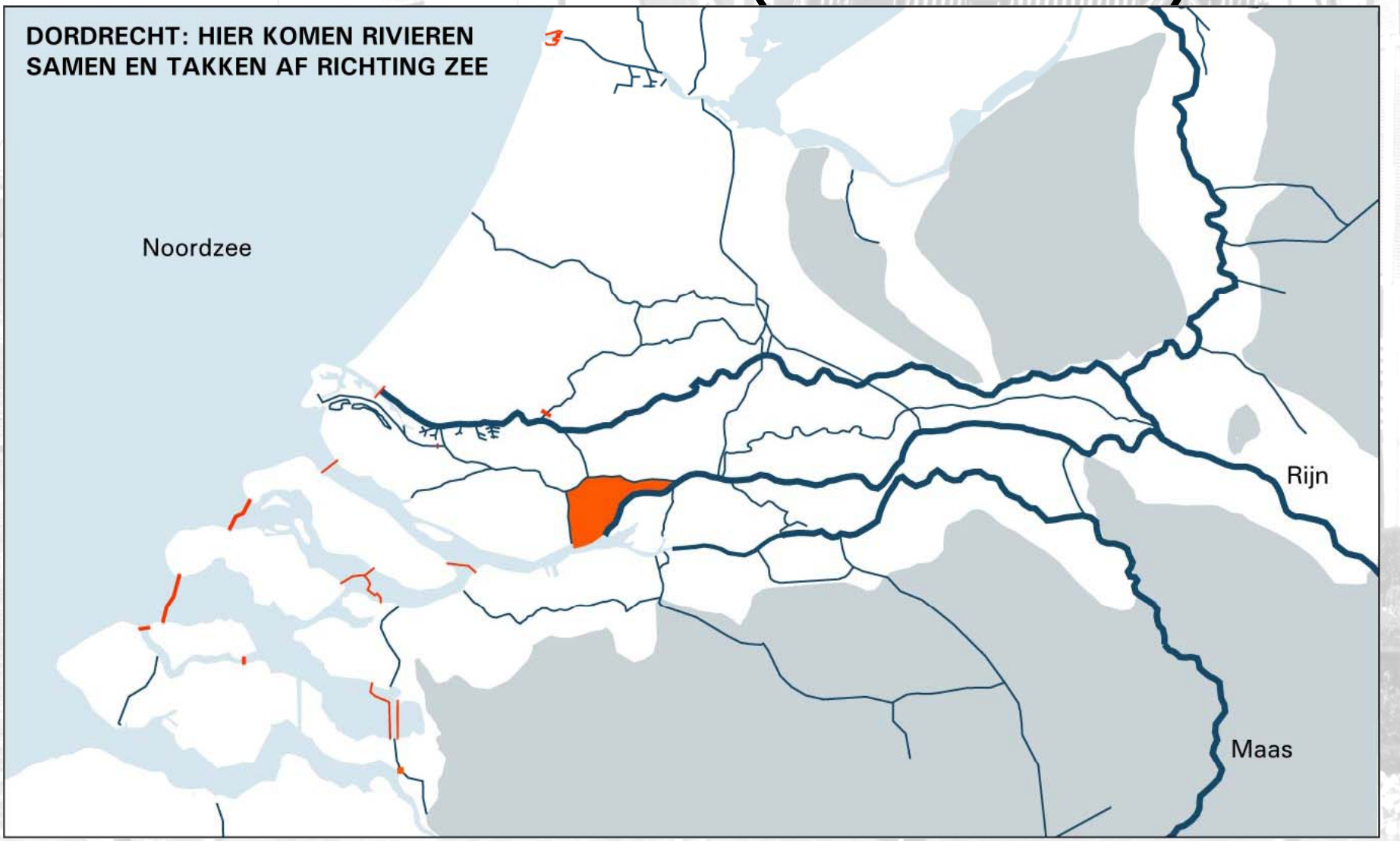
Local scale interventions

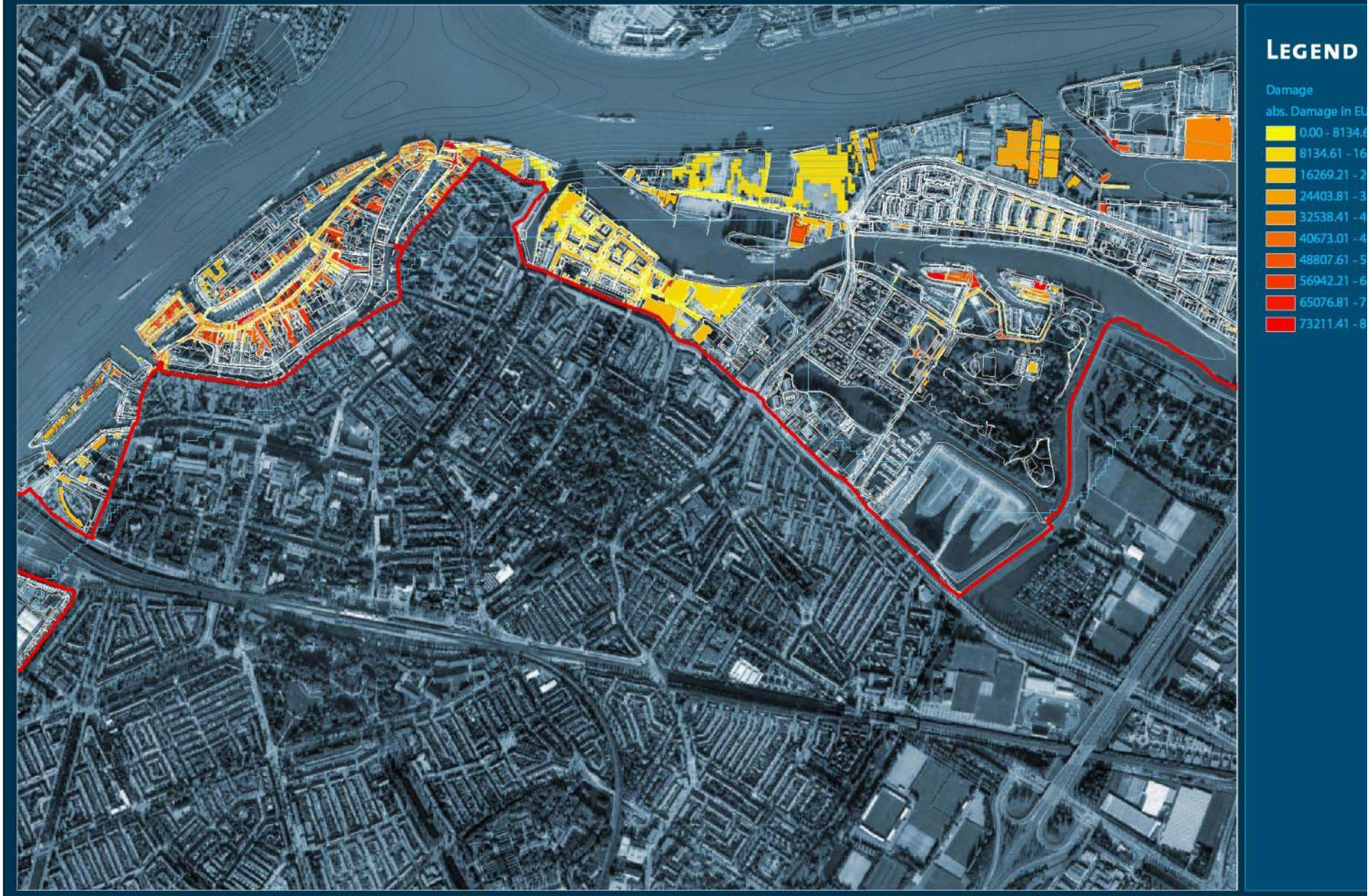



baca


LifE
Long-term Initiatives for
Flood-risk Environments
RIBA London
SUSTAINABLE LIVING BY
DESIGN - WINNER
DEFRA
DTI
ENGLISH PARTERSHIPS
DURA VEMEER GROUP
baca
bre
LDADESIGN
FULCRUM CONSULTING
English Partnerships
HR Wallingford
cyril sweett
LifE

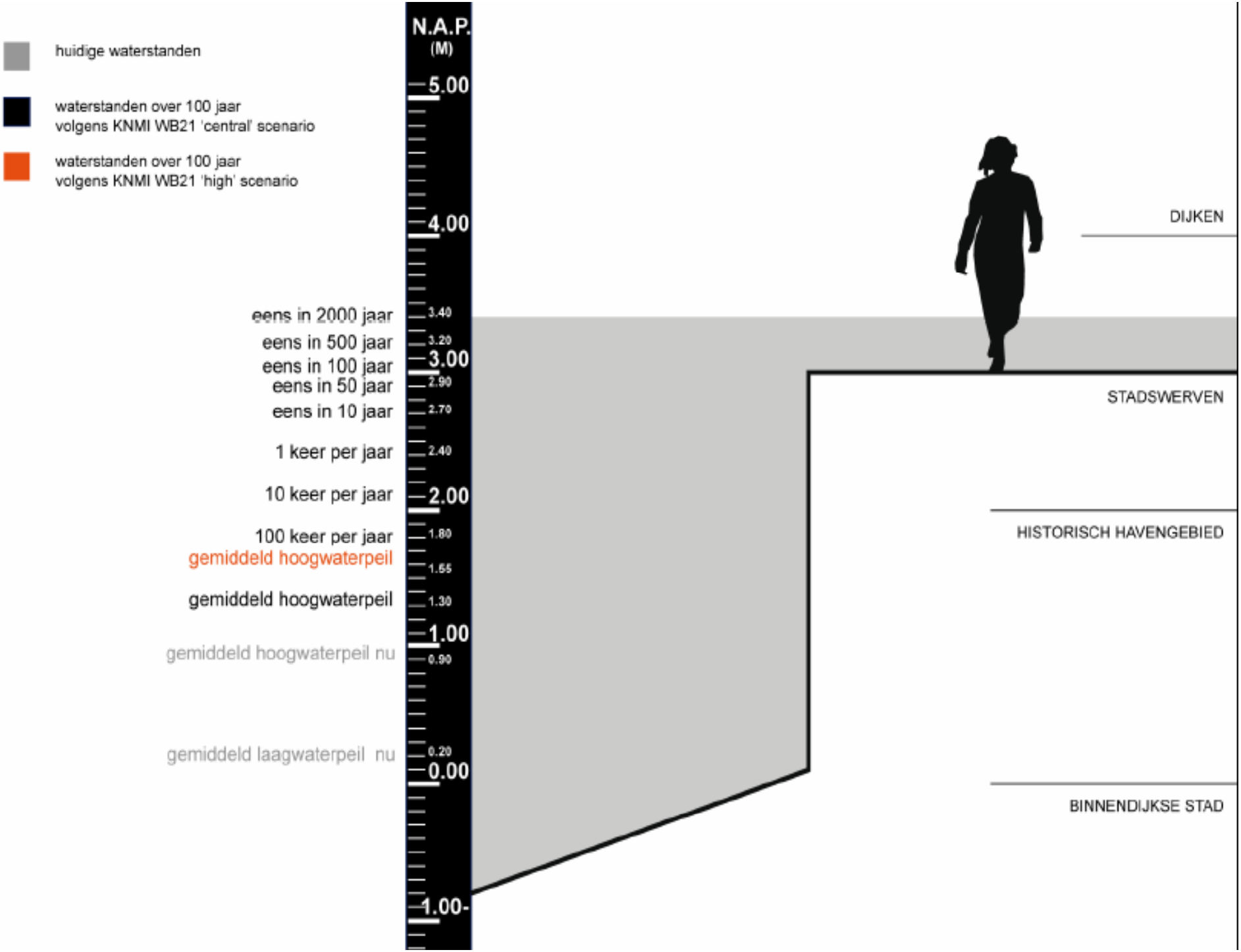
Drechtsteden (Dordrecht)





Dordrecht Buitendijks. 1:4000 flood

0 130 260 520 780 1,040
Meter


huidige waterstanden
waterstanden over 100 jaar
volgens KNMI WB21 'central' scenario
waterstanden over 100 jaar
volgens KNMI WB21 'high' scenario
N.A.P.
(M)
5.00
4.00
3.40
3.20
3.00
2.90
2.70
2.40
2.00
1.80
1.55
1.30
1.00
0.90
0.20
0.00
1.00-
eens in 2000 jaar
eens in 500 jaar
eens in 100 jaar
eens in 50 jaar
eens in 10 jaar
1 keer per jaar
10 keer per jaar
100 keer per jaar
gemiddeld hoogwaterpeil
gemiddeld hoogwaterpeil
gemiddeld hoogwaterpeil nu
gemiddeld laagwaterpeil nu
DIJKEN
STADSWERVEN
HISTORISCH HAVENGEBIED
BINNENDIJKSE STAD

Pilot

What brings the near future ?
Key elements in EU

- *Autonomous development*: further intensification of land use and increase level of investments in low lying areas
- *Governments* are concerned about continuing their tradition of taking responsibility (risk sharing);
- *Policy*: strong planning system that incorporates flood risk as steering principle;
- *Societal needs*: low tolerance and liability (risk reduction);
- *Insurance and construction industry*: codes for sustainable building including resilience to floods, innovation in building technology
- Flood Directive: long term perspective & climate change
- **Climate proofing future investments (adaptation)**

Conclusions (1)

Adaptation is not an easy task

It requires:

- technical know how and substantial funding
- political will and the presence of institutional structures
- co-makership of public and private stakeholders, policymakers and scientists
- long-term perspective and short-term benefits/synergies

Conclusions (2)

- No best solution
- Cultivated/enhance resilience: mixed approach
- ‘Learn as we go’
- Iterative urban design:
  - Life-cycle consideration and retrofitting
  - Extreme events
  - Innovative architecture and technology
- Pioneering and experimentation