Ministerie van Verkeer en Waterstaat

Flood Risk Mapping in Europe,
## Experiences and Best Practices

EXCIMAP

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Outline

1. Background: floods in Europe and Directive on Assessment and Management of Flood Risk

2. Flood maps: what do they present?

    *   Hazard maps
    *   Risk maps

3. Maps and potential use : hazard cycle, users and information content

4. Conclusions

1. Background: Floods in Europe

River catchments affected by flooding (1998-2005)
- Once
- Twice
- 3 times
- 4 times
- 5 times
- 6 or more times
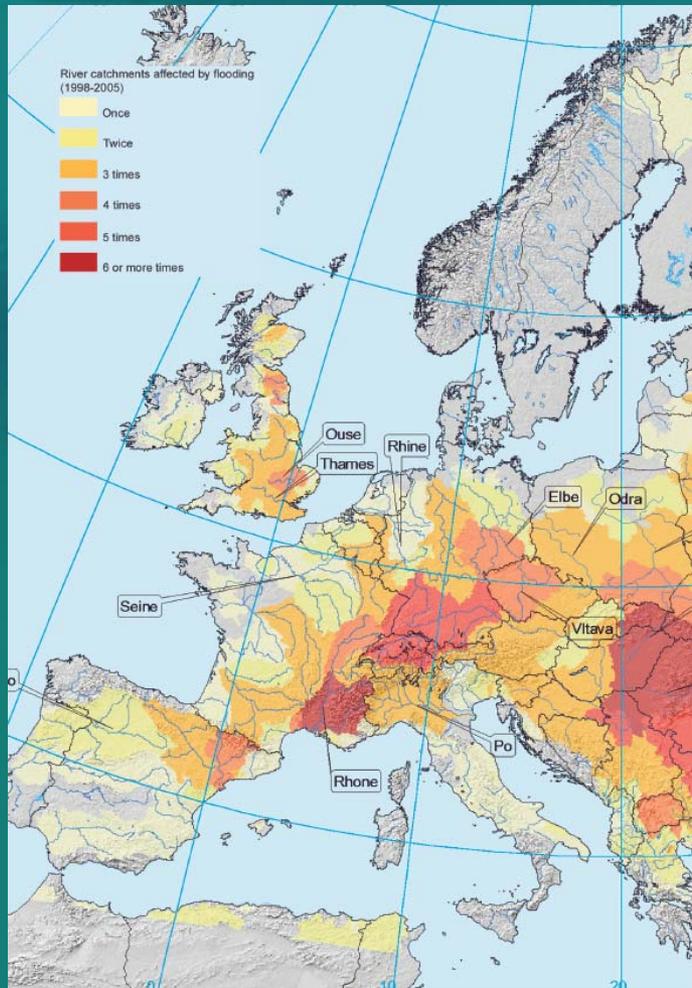
Between 1998 - 2004:

- \> 100 major floods

- \> 25 billion Euro's damage

- 0.5 million people displaced,

- 700 fatalities

(EEA, 2004)

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2002 floods: trigger to a joint approach

mid 2003:

Best Practices on flood prevention, protection and mitigation

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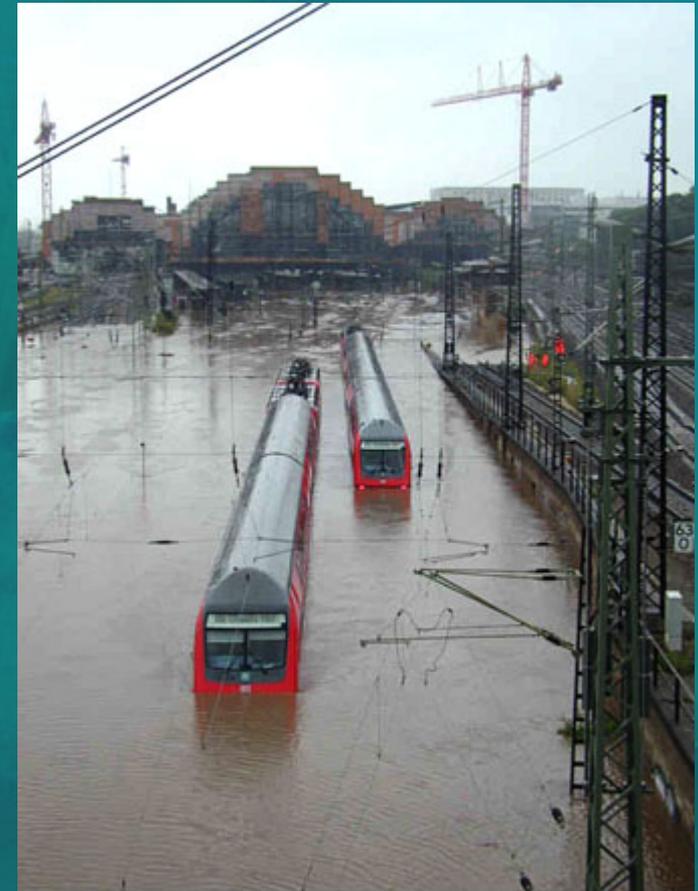
2004: start of European policy

July 2004: EU-Commission:

- Communication on Flood Risk Management
- Expert circles (EXCIMAP)
- Flood action programme:
  - Facilitate exchange of information, knowledge and experiences (Floodsite, ERANET)
  - Targeting approach to funding
  - Proposal for legal instrument (→ Directive)

EU Directive on Assessment and Management of Flood Risk (2007)

Aim: <u>framework</u> for the assessment and management of flood risks, → <u>reduce adverse consequences</u> for human health, environment, cultural heritage and economic activity.

Member states are free to formulate goals of protection, select measures and organization.

However are obliged:

- Preliminary risk assessment (2011)
- Flood hazard and flood risk maps (2013)
- Flood risk management plans (prioritized measures) (2015)
- Report progress to EC, periodically review of maps and plans every 6 years

Basic principles?!

2. Flood maps, what do they present?

Possible content (EU Flood Risk Management Directive)

- Potential flood extent
- Probability of flooding
- Depth of flooding
- Potential damage, affected, environmental consequences
- Vital services and infrastructure
- Flood risk (probability x consequences)
- Hazardous locations (depth/velocities)
- Locations of vulnerable citizens (elderly, children)
- Evacuation routes and shelters

2a. Flood <u>hazard</u> maps
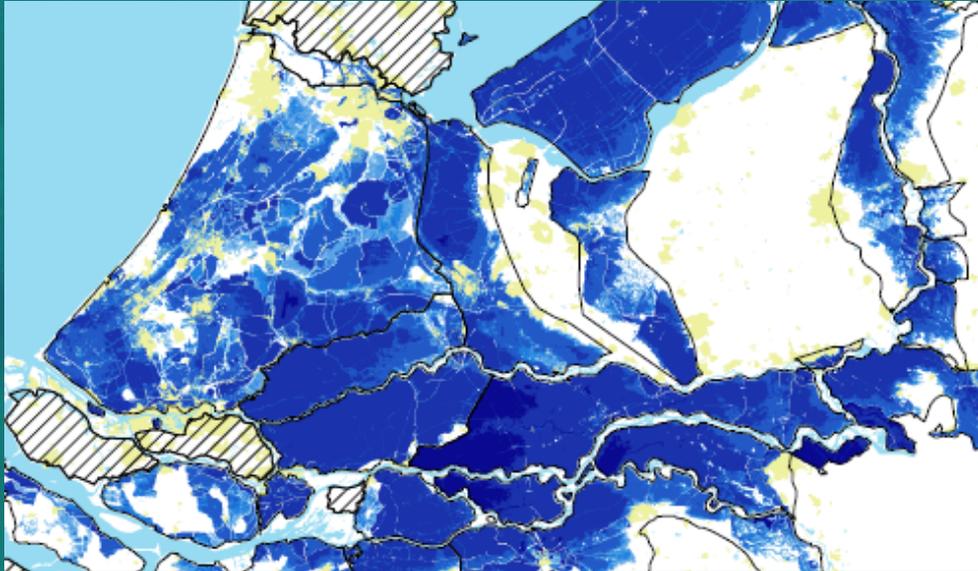
For areas with significant risk, for 3 types of floods:

- floods with a <u>low</u> probability, or extreme events scenarios;
- floods with a <u>medium</u> probability (recurrence period about 100 years);
- floods with a <u>high</u> probability, where appropriate.

Showing:

- the flood **extent**;
- water **depths or** water **level**, as appropriate;
- where appropriate, the flow velocity or the relevant water flow

2b. Flood <u>risk</u> maps
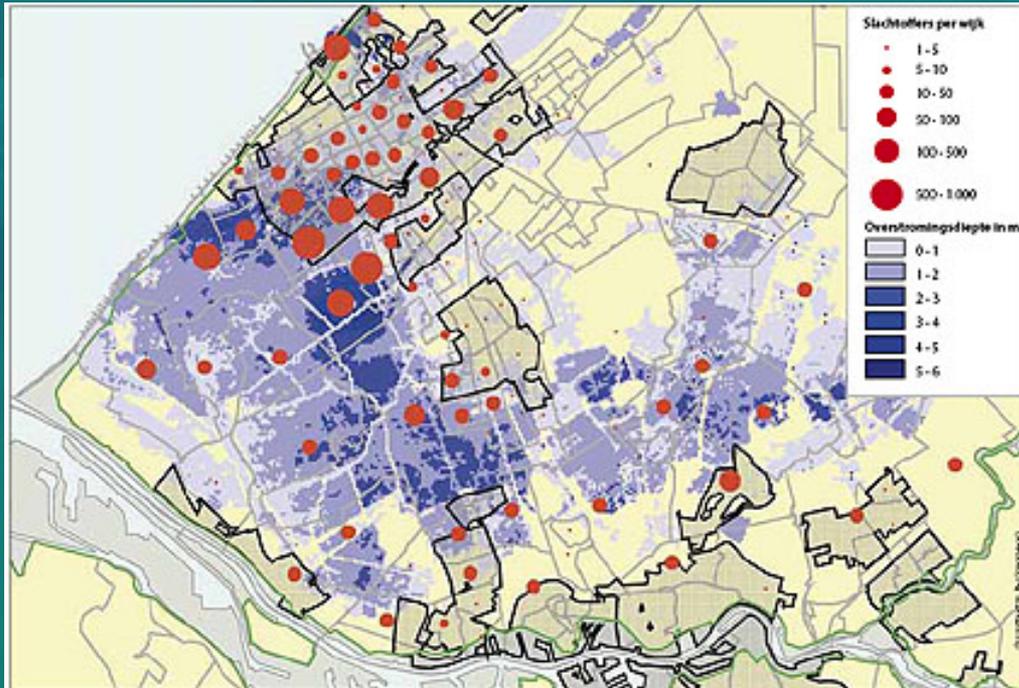
potential adverse consequences:

- the indicative number of **inhabitants** potentially affected;

- type of **economic activity** of the area potentially affected;

- **IPPC**-installations

- protected areas cf WFD that may be threatened by flooding;

- other information which the Member State considers useful, such as:
  - (...)
  - other significant sources of pollution.

Different types and hierarchy of maps

Fatal water level

+

Surface

→

+

Scenario's →

Flood prone area (1)

HAZARD

Flood probability, -depth, rise progress, current velocities (2)

+ highways,

Population →

evacuation (5)

+

Land use →

Infrastructure,

Inhabitants

Pollutants

(environmental) damage casualties (3)

RISK

+ →

Flood probability

risk (4)
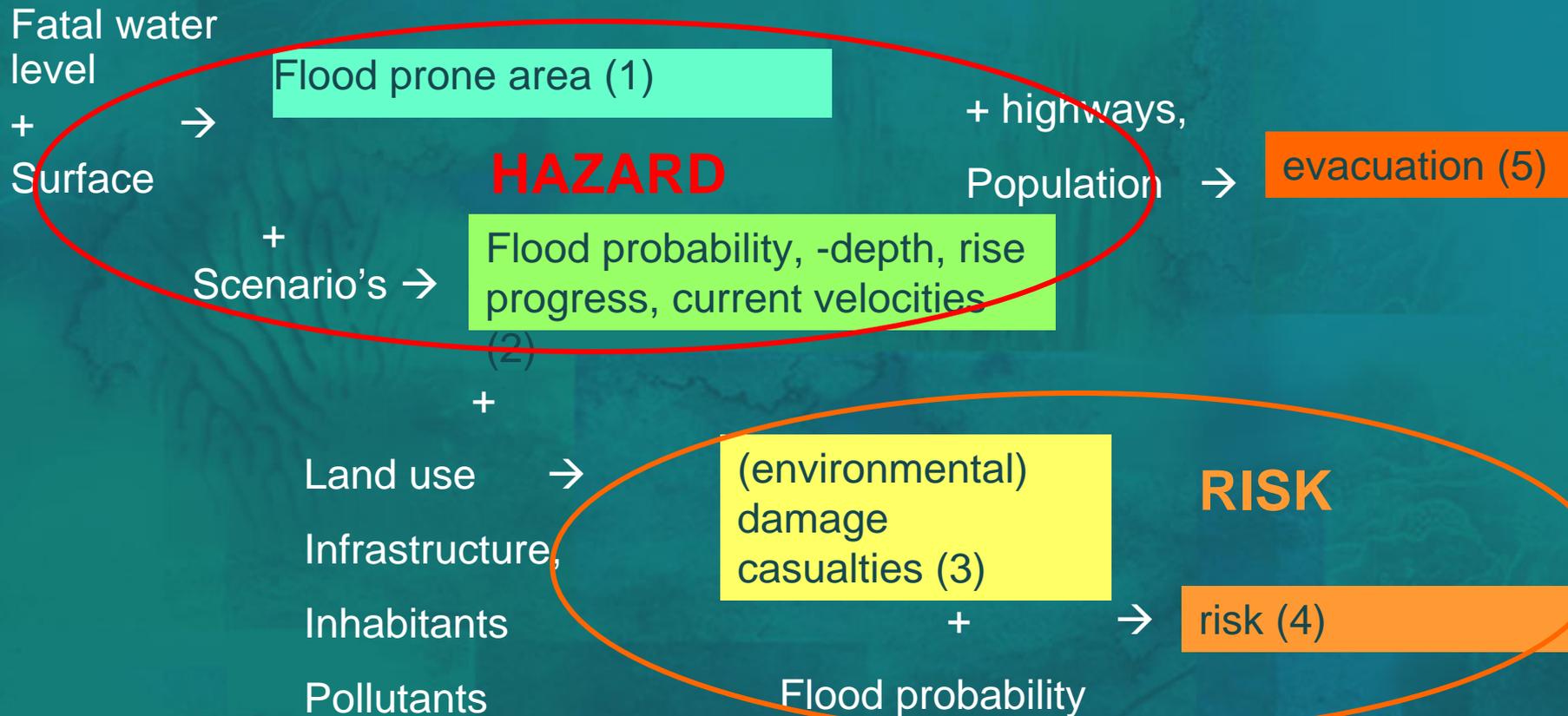
Potential flood extent
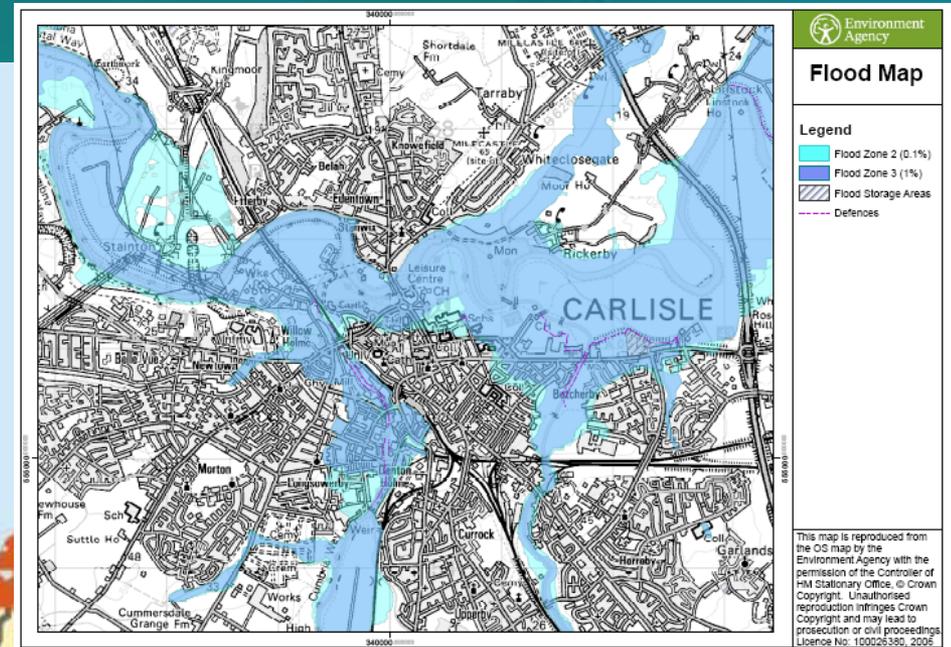
Flood extent
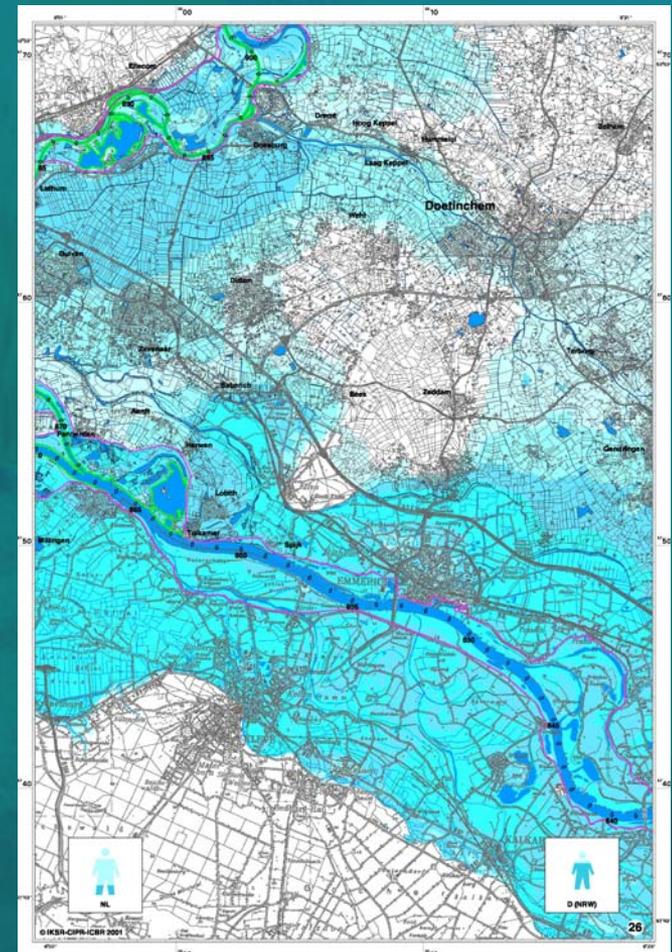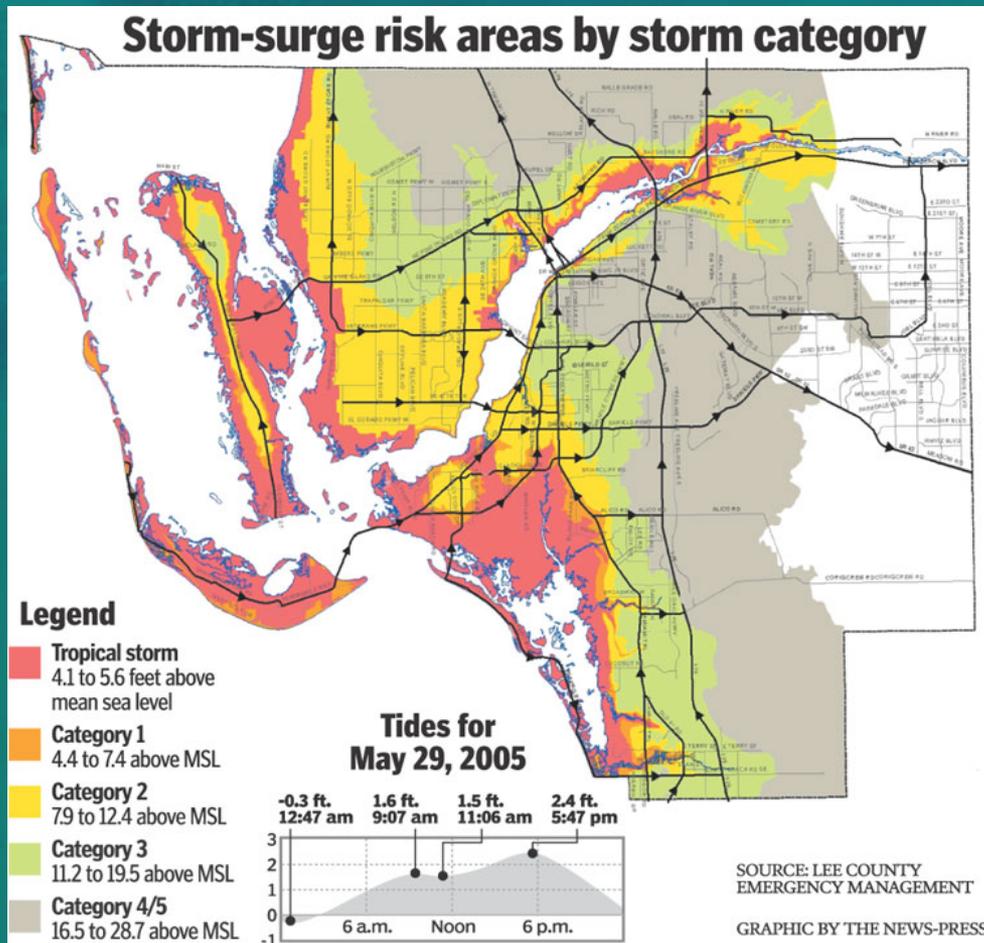
Scenario's → max. depth of flooding

For specified scenario:
. failure locations, dimensions,
. hydraulic conditions/ frequency
. terrain topography and roughness
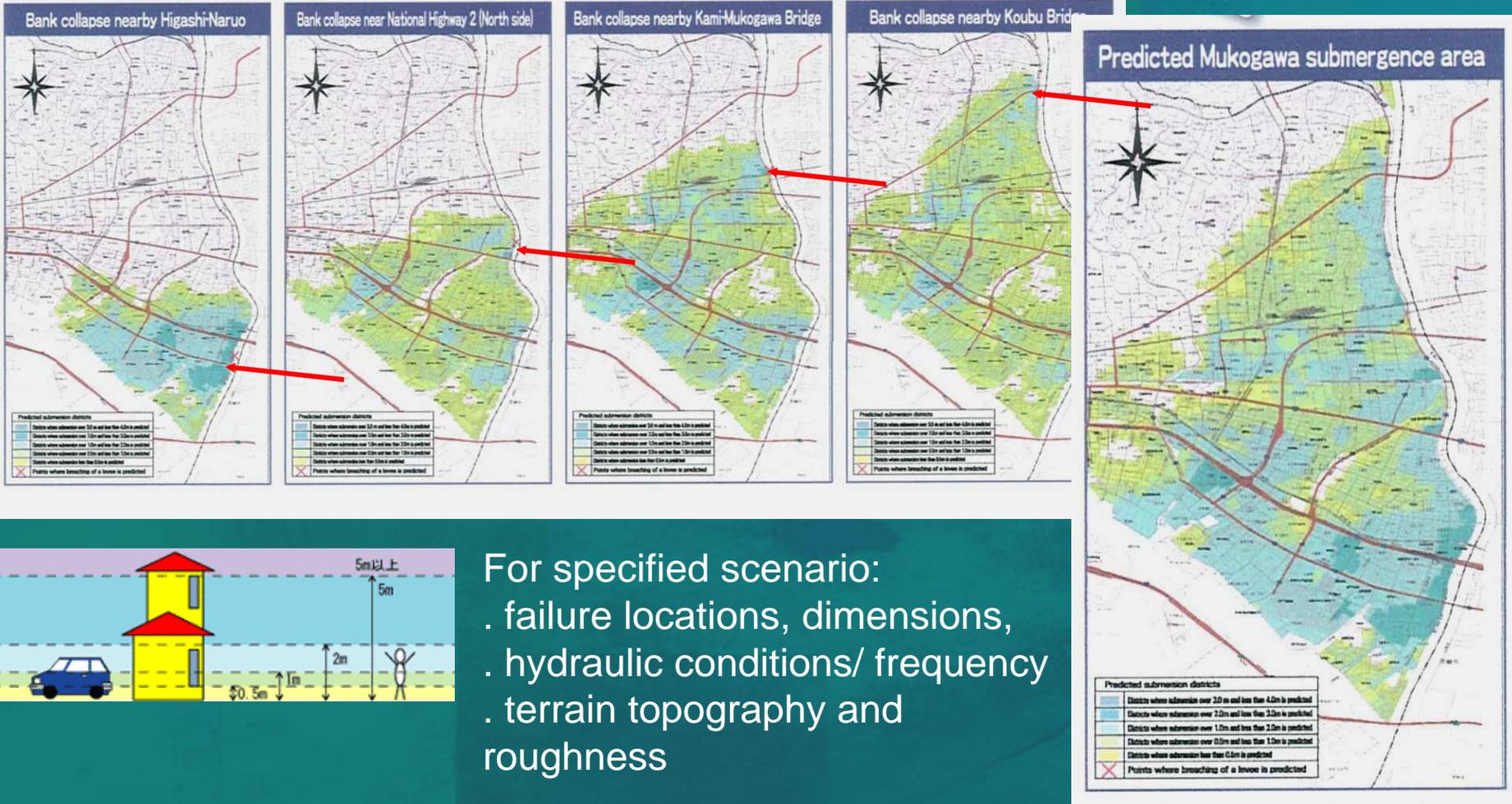
Hazard: progress, rate of rise

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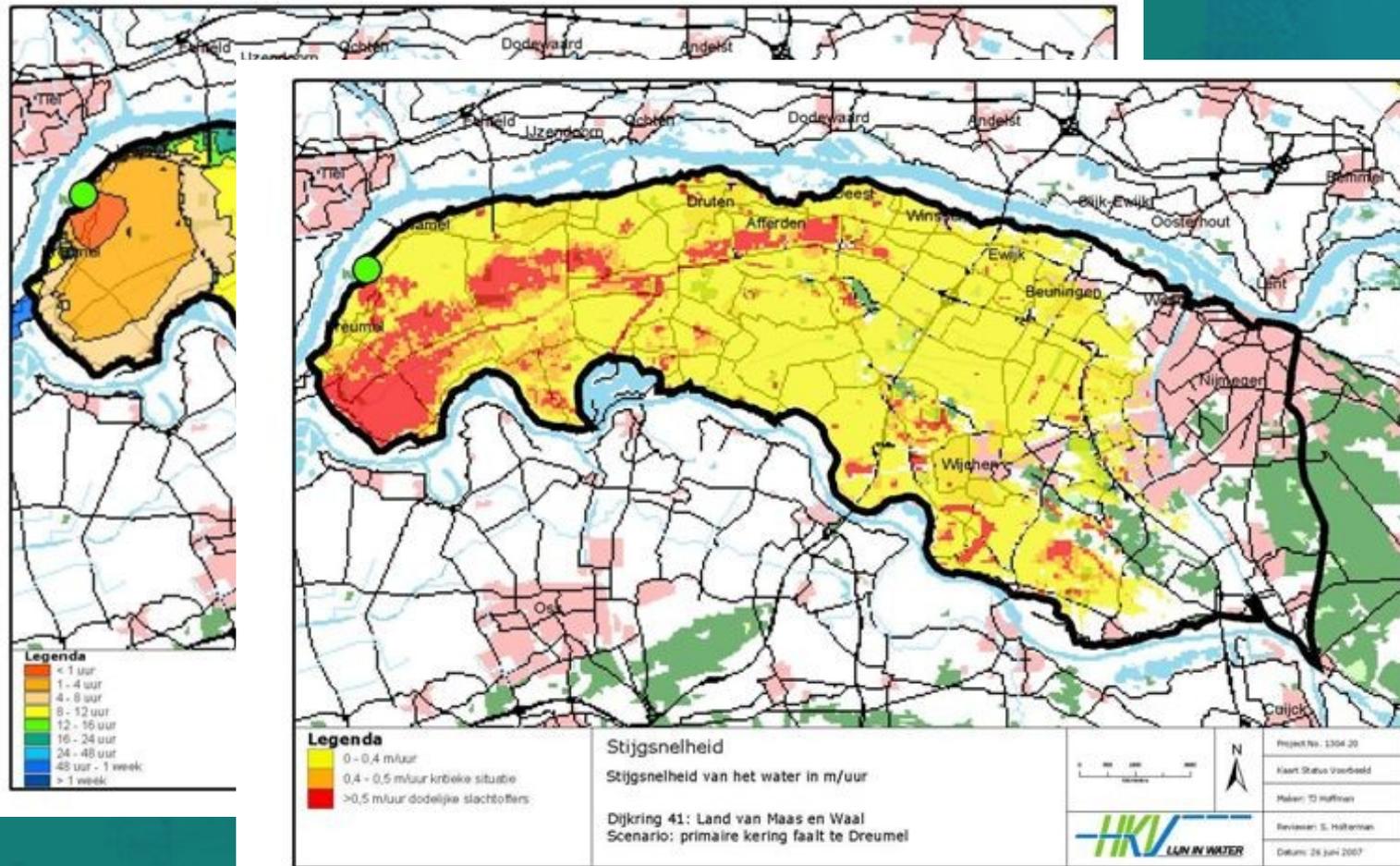
Hazard /Current velocities
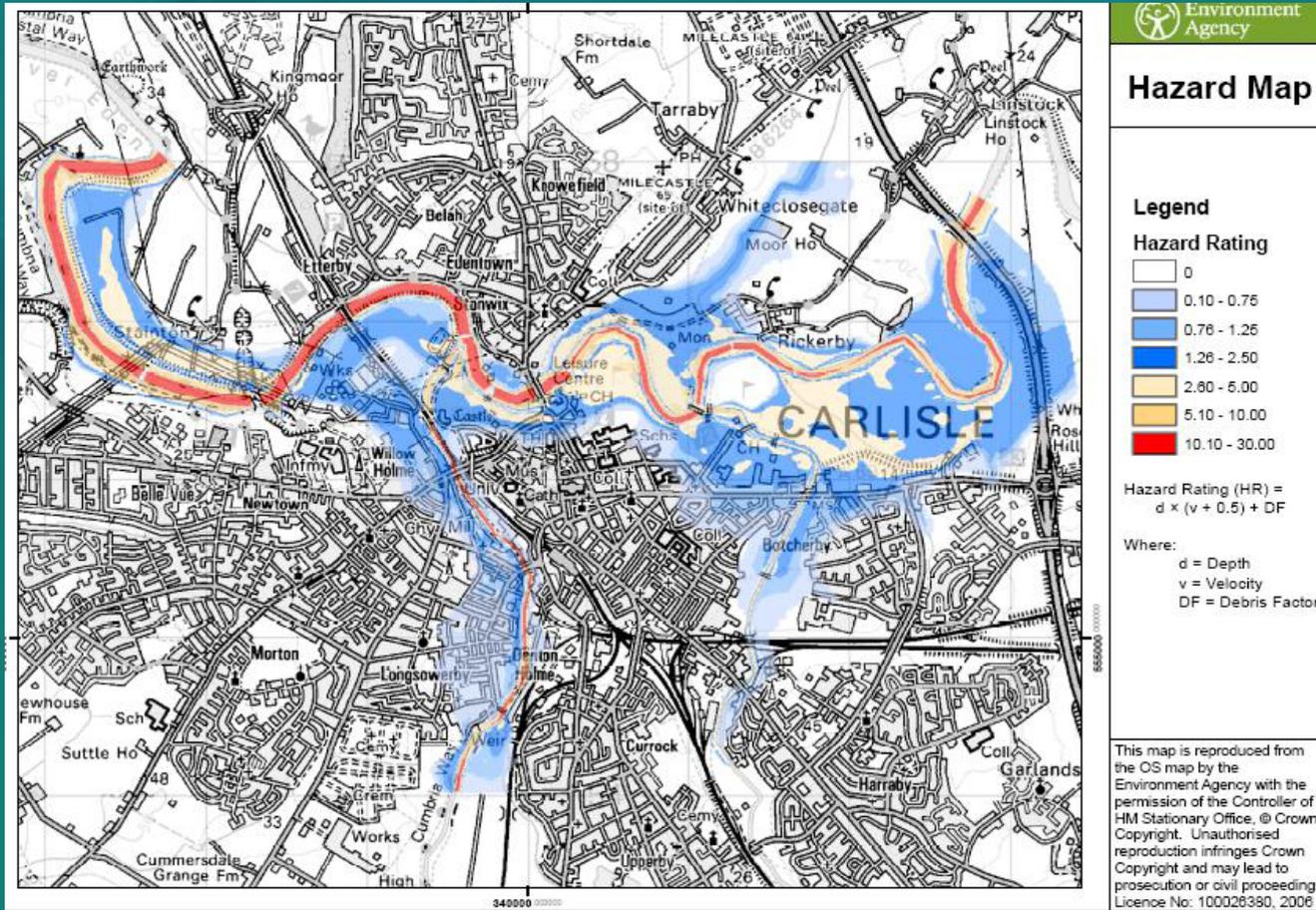
Hazard as combination of:

- Current velocity
- Depth
- Debris

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Hazard

Process	low intensity	medium intensity	
Debris flow	--	D < 1 m and v < 1 m/s	
Static flooding	h < 0.5 m	0.5 < h < 2 m	
Dynamic flooding	q < 0.5 m^2/s	0.5 < q < 2 m^2/s	
Bank erosion	t < 0.5 m	0.5 < t < 2 m	

D = thickness of debris front; v = flow velocity (flood or debris flow); h = fl
specific discharge (m^3/s/m) = h x v; t = extent of lateral erosion
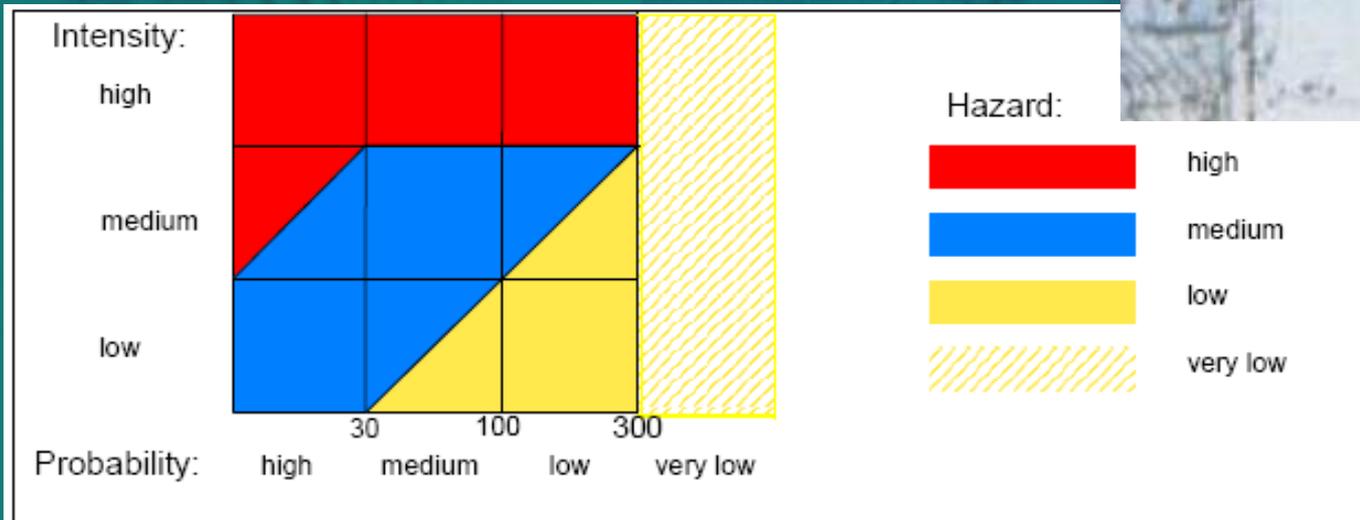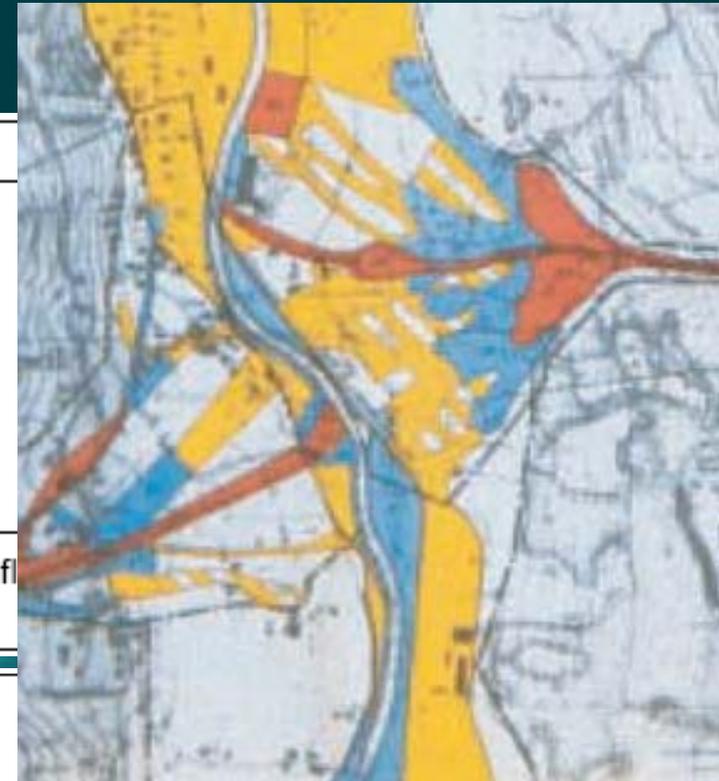
Potential damage
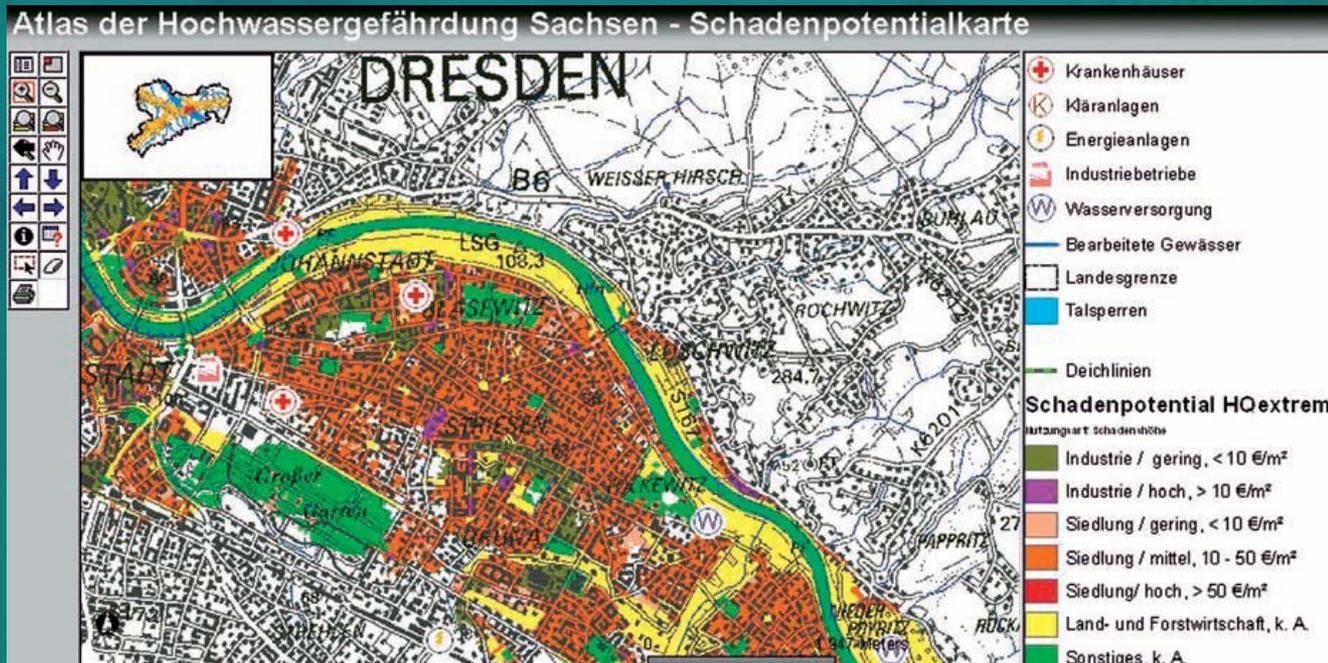
Damage in euro /m²

Flood risk map for insurance
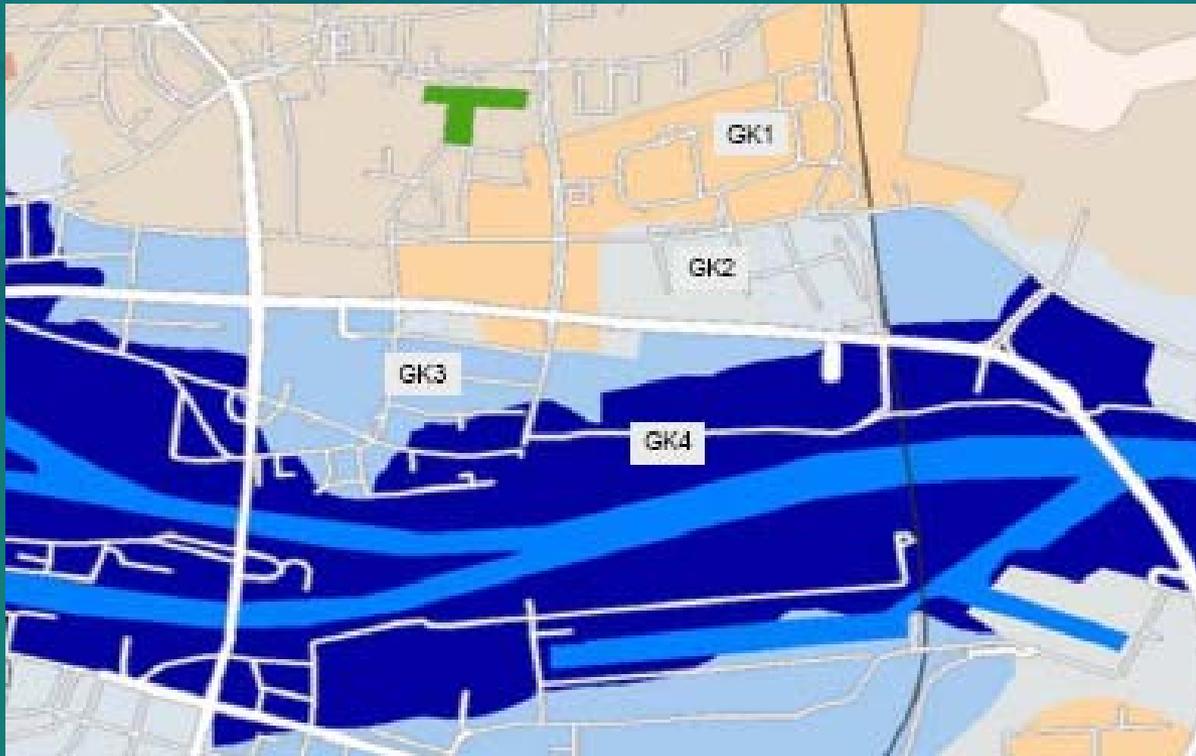
- GK1: very low risk (< 1/200)

- GK2: low risk (1/50 – 1/200)

- GK3: medium risk (1/10 –1/50)

- GK4: high risk (>1/10)

Risk = probability!

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Risk / vital objects

Atlas der Hochwassergefährdung Sachsen - Überschwemmungskarte

Legende

⊕ Krankenhäuser
Ⓚ Kläranlagen
⚡ Energieanlagen
Industriebetriebe
Ⓦ Wasserversorgung
— Bearbeitete Gewässer
Landesgrenze
Talsperren

Deichlinien
Überschwemmungsgebiet HQ100

Wassertiefen HQextrem
Tiefe [m]

0 - 0,5
0,5 - 2,0
2,0 - 4,0
> 4,0

Social vulnerability
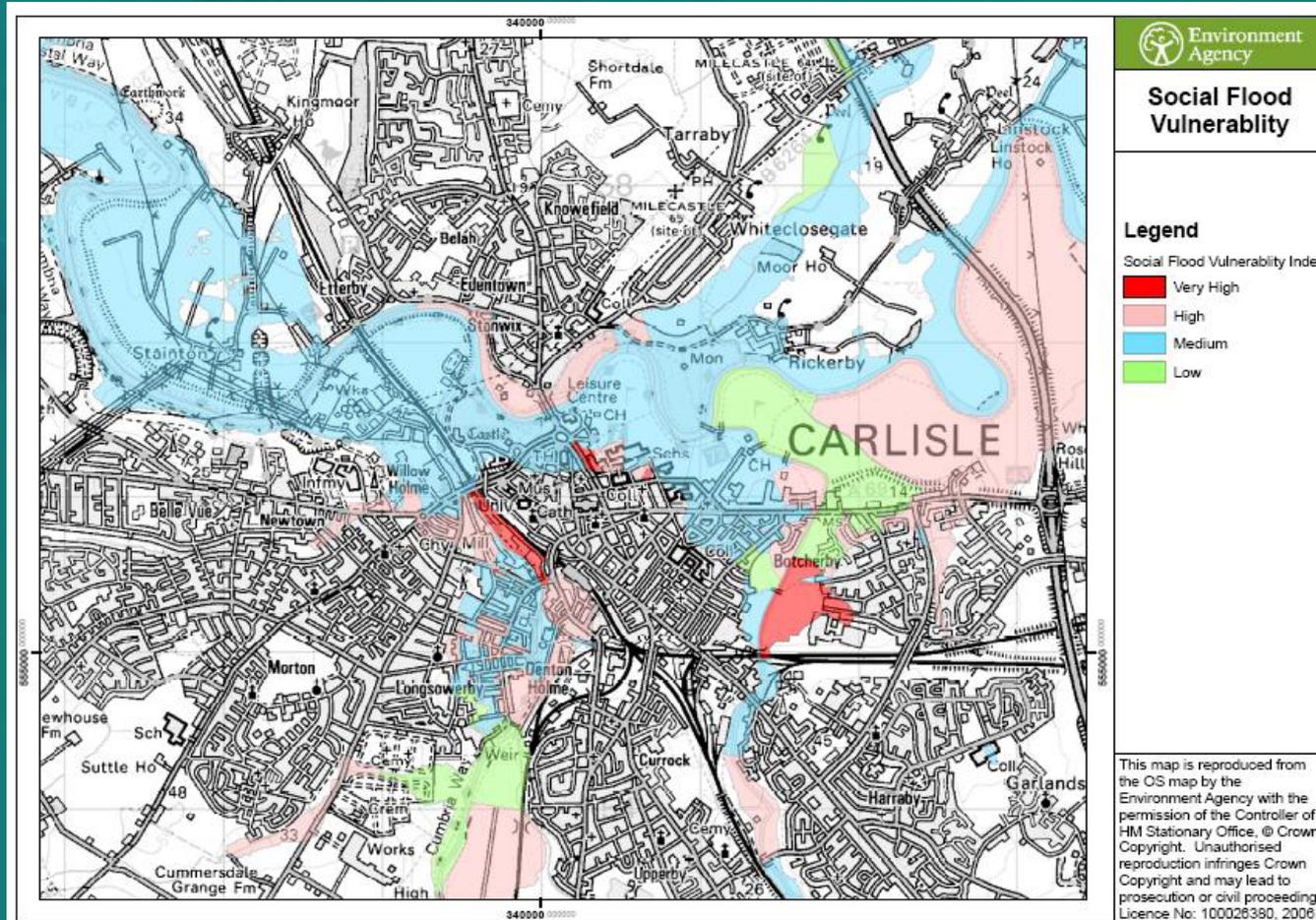
- Age
- TV and Radio
- Own car
- Unemployment
- House owner

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3. Type of map and potential use: the "hazard cycle approach"

Avoid	Reduce probability	Reduce consequences		
Spatial planning	Dikes, dams, storm surge barriers	Contingency plans		
Pro-action	Prevention	Preparation	Response	Recovery

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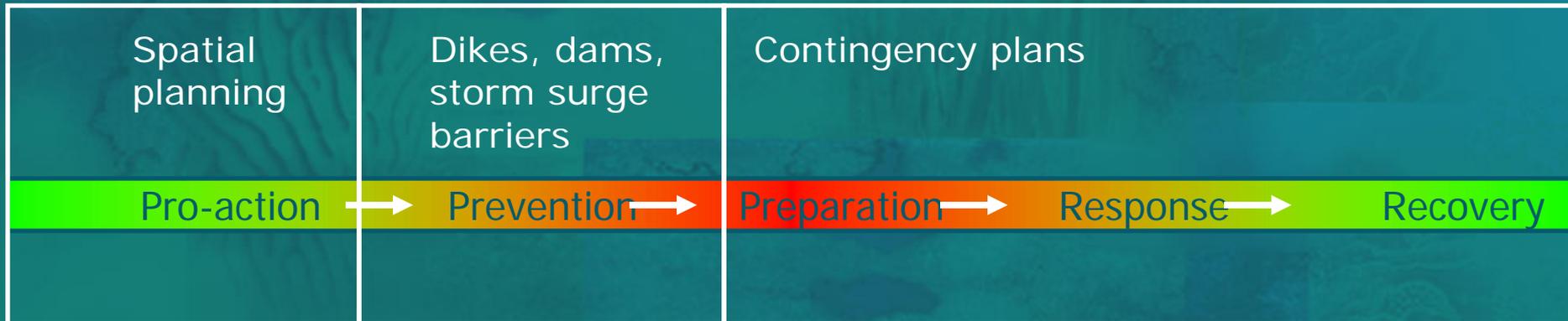
Avoid

Spatial Planning:
- Hazard zones
- Building codes

Prevention

- Build and maintain flood defences:
  - sea walls
  - storm surge barriers)
  - Dikes/ embankments

Prepare
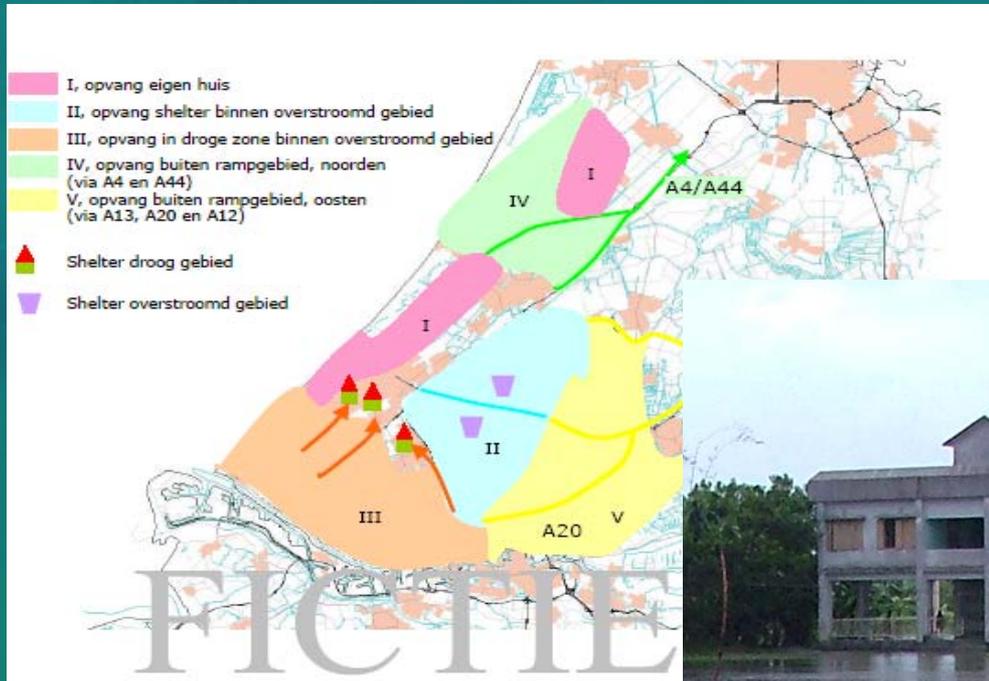
- Emergency and contingency planning
- Shelters

Response

- Early warning
- Evacuation
- Emergency repair

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Repair and recovery

- Repair damage
- Insurance

Potential users:

- Authorities responsible for:
  - Land use planning
  - Flood protection
  - Emergency planning
- Companies responsible for vital services (electricity, gas, water, sewerage, communications, transport, hospitals)
- Insurance
- Citizens and businesses

Flood maps, users and content

	Extent/ probab	Depth	Velocity/ Debris	Progress/ Rise	Vulne- rability	Risk objects
Land use plng. (Avoid)	E	d	(d)			(d)
Flood risk Mngmt Planning (Prev.)	E	E	d	d	E	E
Emergency Plng (Prepare/ respons)	E	E	E	E	d/E	d/E
Insurance (Recover)	E	d	d			E
Public awareness	E	d		d		

E=Essential

d=desirable

Conclusion

- Flood risk maps are vital for land use planning, preparation, response and general awareness in flood prone areas

- Flood risk maps contain specific types of information (extent, depth, ..), depending on their primary purpose

- Different types of maps require increasing types of background information (flood level, surface, land use, population densities and groups, vital services, highways)

Any questions?

Atlas of Flood Maps
Examples from 19 European countries, USA and Japan

EXCIMAP

http://ec.europa.eu/environment/flood_risk/flood_atlas/index.htm

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