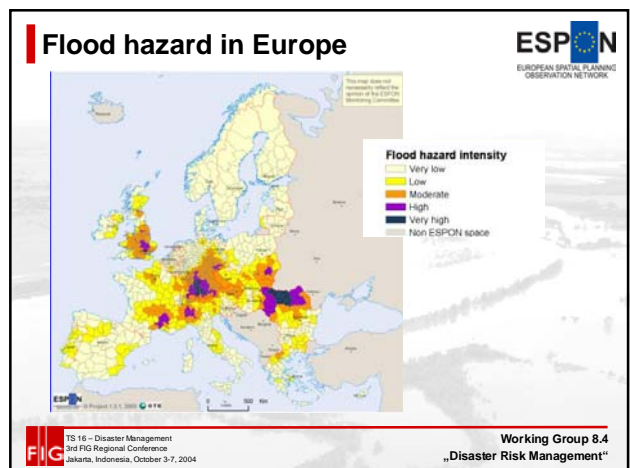
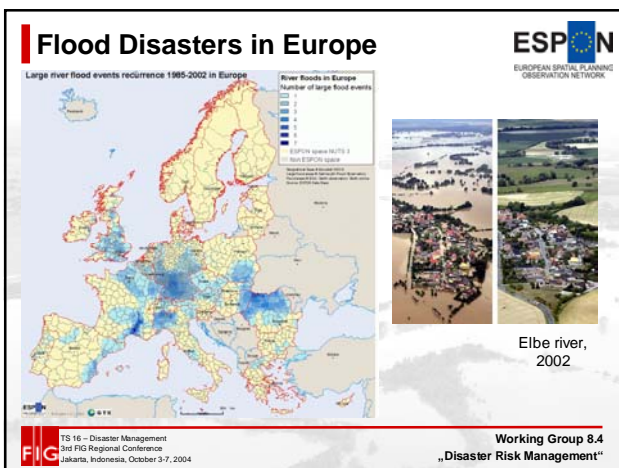
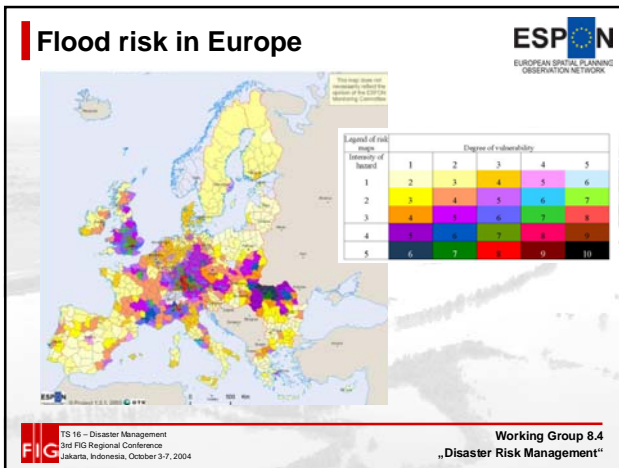


Severe Haiti Flooding (September 2004)

- > 1.000 people died from flooding and mudslides triggered by Tropical Storm „Jeanne“
- Gonaives: 80% of its inner urban population of over 100.000 had been affected by the floods
- one cause: extensive deforestation

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Flood catastrophe at Elbe river 2002



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Flood catastrophe at Elbe river 2002

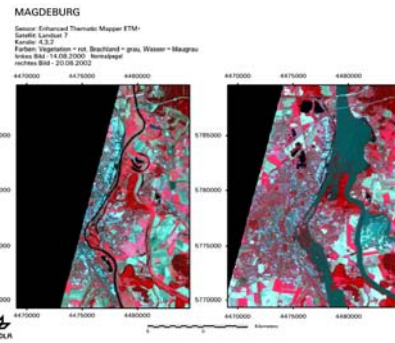


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Flood Disaster Management in Europe



- July 2004: The EC proposed **concerted EU action on flood risk management** to improve protection against flooding
- The EC has been supporting **research on floods** since the early 1980's through its successive Framework Programmes (FP) for research and technological development
- New **joint European initiatives** on flood prevention (e.g. IRMA)



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Flood Disaster Management in Europe



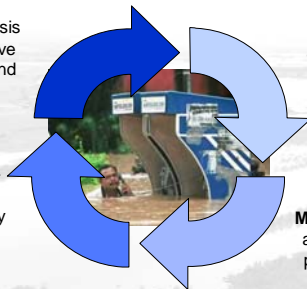
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Disaster Risk Management

Recovery on basis of comprehensive planning and land management

Organisational + infrastructural **preparedness** by risk monitoring, forecasting and early warning systems



Analysis and assessment of danger and vulnerability

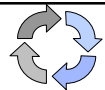
Mitigation by urban and rural land-use planning and land management

DRM Cycle

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Managing the Risk of Floods



- Risk analysis/assessment**
 - Intensity, frequency and probability of flood events
- Prevention/mitigation**


preventing damage caused by floods

 - by avoiding construction of houses and industries in present and future flood-prone areas
 - by adapting future developments to the risk of flooding and
 - by promoting appropriate land-use, agricultural and forestry practices


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Managing the Risk of Floods



- Preparedness**
informing the population about flood risks and what to do in the event of a flood
- Emergency response**
developing emergency response plans in the case of a flood
- Recovery and lessons learned**
returning to normal conditions as soon as possible and mitigating both the social and economic impacts on the affected population

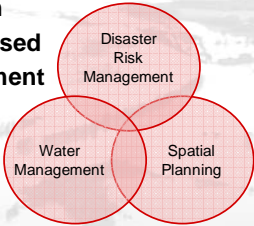
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Flood Disaster Risk Management

New long-term strategy for reducing flood damage based on three objectives:

- Give the rivers more room**
- Restrain floods decentralised**
- Control housing development**



Germany:
 Law on Improvement of
 Preventive Flood Protection

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More room for rivers?




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Spatial restrictions!

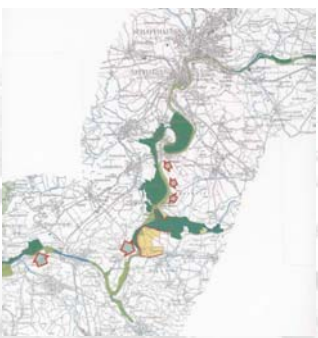



The Central Rhine
 The Lower Rhine
 The Upper Rhine

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The Upper Rhine




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The Central Rhine



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The Rhine between Mainz and Koblenz



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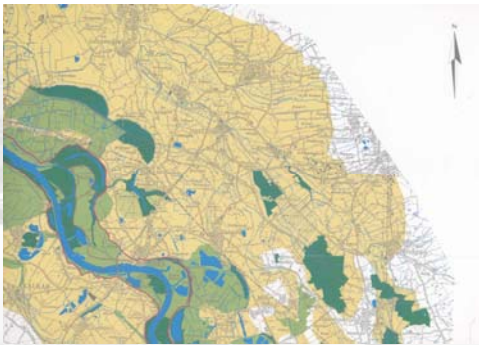
The Lower Rhine



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The Rhine Delta



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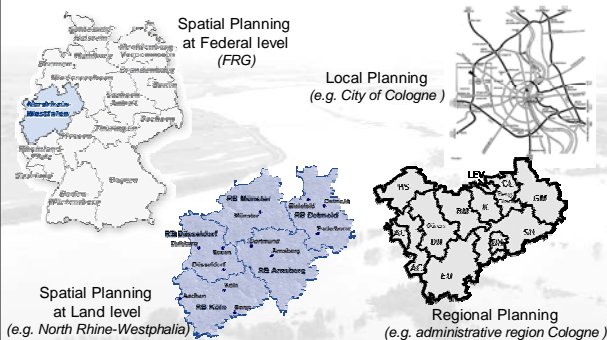
Spatial Planning System in Germany

State structure	Level of planning
Federation	Spatial planning at Federal level
Laender	State planning (Spatial Planning at Land level)
Region	Regional planning (for parts of the Laender)
Municipalities	Local planning (Urban land-use planning, area development planning)

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Spatial Planning System in Germany



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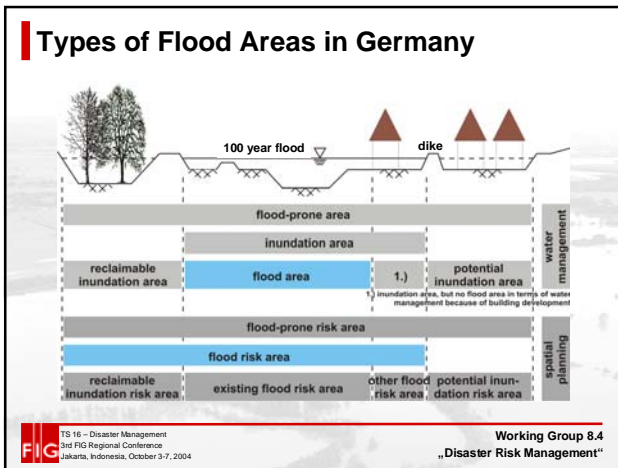
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Instruments of Flood Protection in Germany

Fields of action	Legal foundations	Supra-regional and regional instruments
Spatial Planning	Federal Regional Planning Act (1998)	<ul style="list-style-type: none"> Declaration of flood risk areas as priority areas Declaration of flood risk areas as reserve areas
Water Management	Water Management Act (1996)	<ul style="list-style-type: none"> Determination of flood areas Installation of flood action plans Installation of regional flood concepts
Disaster Risk Management		<ul style="list-style-type: none"> Flood forecasting Implementation of early-warning systems Development of flood hazard maps

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Flood Prevention at Federal Level

- Law on Improvement of Preventive Flood Protection (2004)
- Obligatory flood measures in high-risk areas
- Restrictions on construction and agricultural use in these areas
- Definition of flood-prone areas
- Obligation to develop flood protection maps

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Contribution of Spatial Planning and Land Management

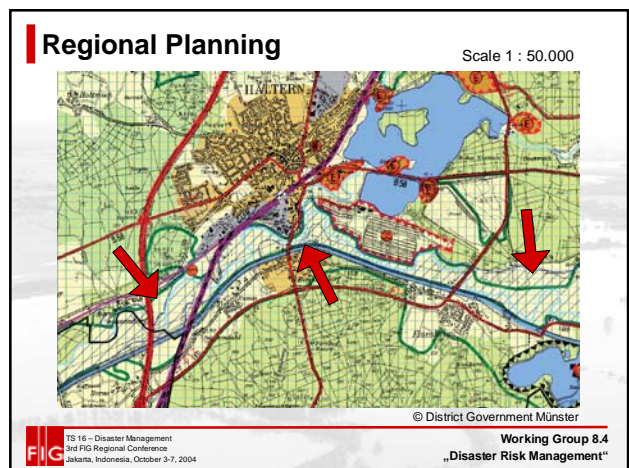
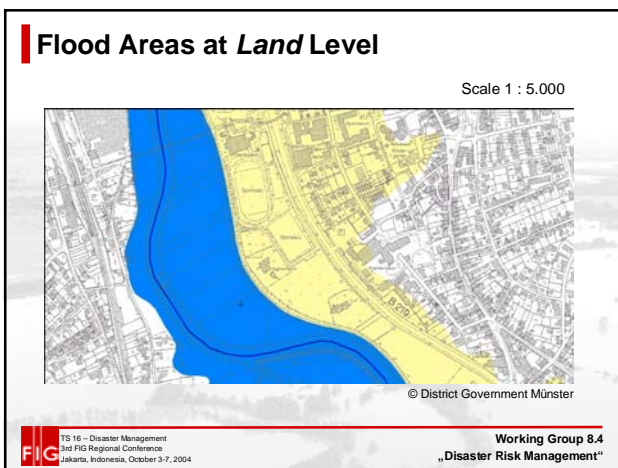
1	Protection of existing retention areas <ul style="list-style-type: none"> declaration of flood areas
2	Extension of retention areas <ul style="list-style-type: none"> backward relocation of dikes creating detention ponds restoration of large streams deepening of retention areas
3	Retention in the catchment <ul style="list-style-type: none"> rainwater storage and greywater use restriction of sealed surfaces reduction of interflow on agricultural and forestry land restoration of small streams
4	Minimisation of damage potential <ul style="list-style-type: none"> preventive land-use management precautionary measures of construction information of the public/improvement of public awareness prediction of floods and warning disaster prevention/control

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Preventive Land-Use Measures

- Conserving, protecting and restoring vegetation, forests, degraded wetlands and floodplains
- Designating immediate flood plains by law
- Stopping building development in the immediate areas at risk of floods
- Existing constructions at risk of flooding should be made flood-compatible

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Flood hazard plan



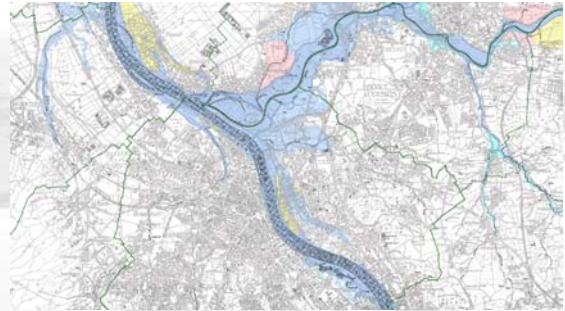
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Digital Map of Flood-Prone Areas



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Strategies at Local Authority Level

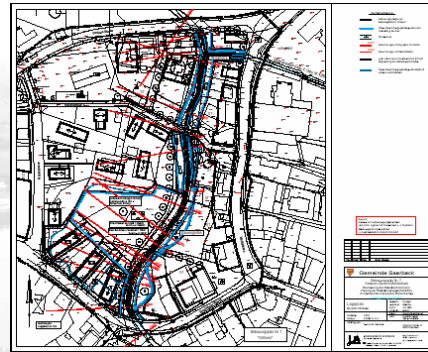
- Preparatory/legally binding land-use plans
 - Direct contribution to flood control
 - Indirect or preventative measures to minimising flood hazards
- Local flood emergency maps
- 3D flood simulation
- Public participation
- Integration of private stakeholders, surveyors in risk assessment



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Local Planning: Legally binding land-use plan



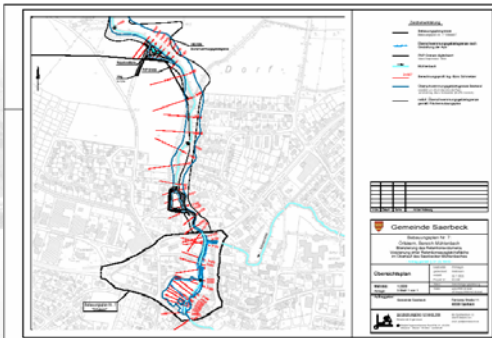
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Local Planning: Legally binding land-use plan



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Local Planning: Legally binding land-use plan



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Scale
1 : 250

Sectoral Planning: Flood Emergency Plans

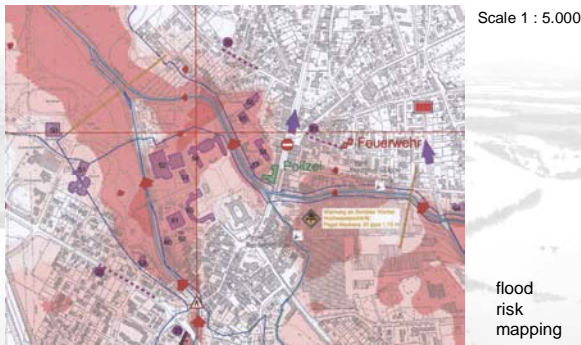


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Detection of Flood Risk Areas via Laserscanning and GIS

- Laserscanning for generation of digital terrain models
- Geographic Information Systems for data management

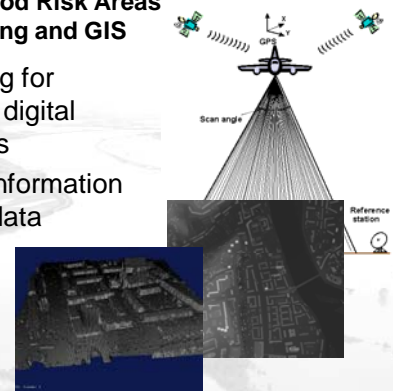


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Flood Simulation

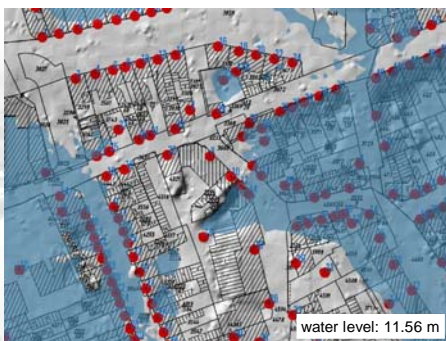


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Flood Simulation

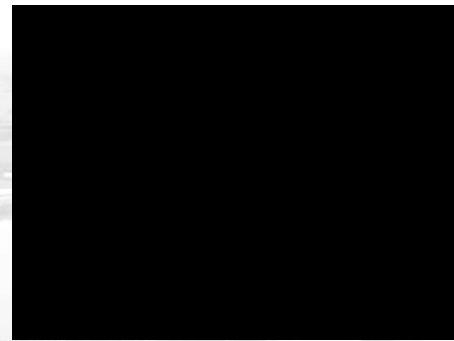


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Conclusions

Contribution of surveyors to flood risk management:



- Collection of flood-relevant data and flood monitoring** by using remote sensing data, satellite data or radar data
- Development of digital elevation / terrain models (DEM/DTM) for **flood simulation** as part of Geographic Information Systems (GIS)
- Development of **instruments for spatial planning** to reduce flood damage; design of **flood hazard maps**

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Recommendations (1/2)

Long-term sustainable spatial planning is needed:

- Limitation of soil sealing in flood-prone urban and rural areas
- Limitation or prohibition of agricultural land-use in flood areas which cause land erosion
- Keep areas open: Avoidance or termination of building development in flood areas, if necessary removal of flood-prone development

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Recommendations (2/2)

Long-term sustainable spatial planning is needed:

- Determination of flood-related objectives, basic principles and flood protection measures in legislative regulations
- Flood (risk) mapping: Delineation of flood (risk) areas, presentation in maps
- Development of appropriate building codes, zoning ordinances or recommendations to reduce flood damage (flood proofing construction)



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International Federation of Surveyors
Fédération Internationale des Géomètres
Internationale Vereinigung der
Vermessungsingenieure

Thank you very much for your attention!

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