



Case Study 5 Rapid Winter Flooding

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 653824

Case Study Area

- **Description**

- Densely populated area in the triangle of DE/CZ/PL
- Center of industry, science, culture, settlements
- City of Dresden as the center, population >500,000
- many smaller cities and towns nearby in the main development area along the valley of the river Elbe
- Hilly topography (up to 1,200 m), smaller water bodies from the mountains are directed to the valley of the river Elbe



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Case Study # Area

- Most severe past floods of river Elbe:
 - 1845 (Mar/Apr)
 - 2002 (Aug)
 - 2006 (Mar/Apr)
 - 2011 (Jan)
 - 2013 (Jun), GLIDE record:



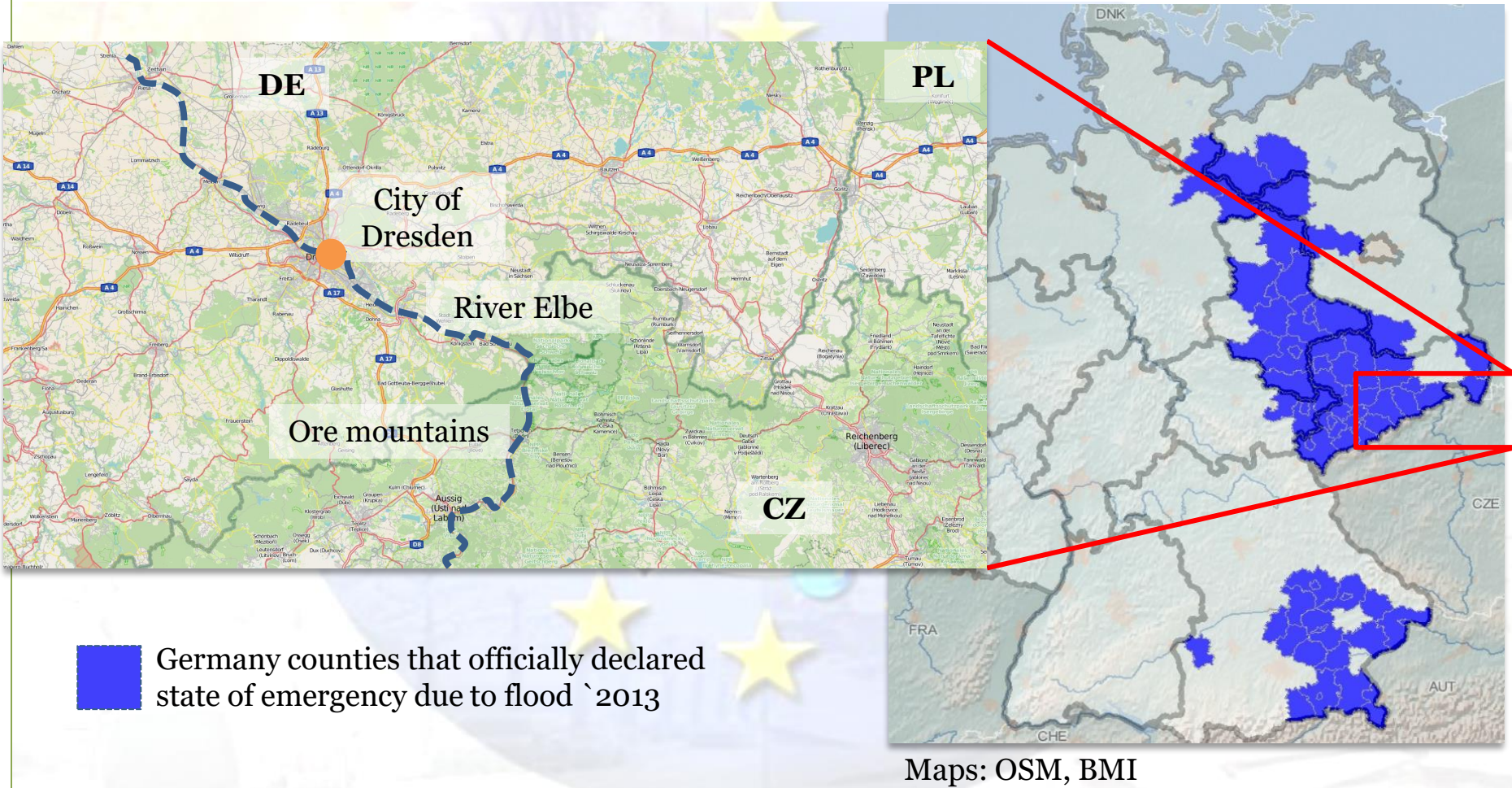
*“Thousands of people have been evacuated from several parts of central Europe due to heavy rainfall and consequent flooding, particularly in the Czech Republic, Germany, Switzerland and Austria. Significant **disruption to overland travel** is expected to persist as further rainfall is forecast in the coming days in the region. Further rainfall, which has been forecast across parts of the region in the coming days, is likely to exacerbate the problems caused by flooding, especially in low-lying areas. **Considerable disruption to essential services, including telecommunications and electricity**, should be anticipated in the affected areas until the weather conditions improve and any damaged infrastructure is repaired.”*



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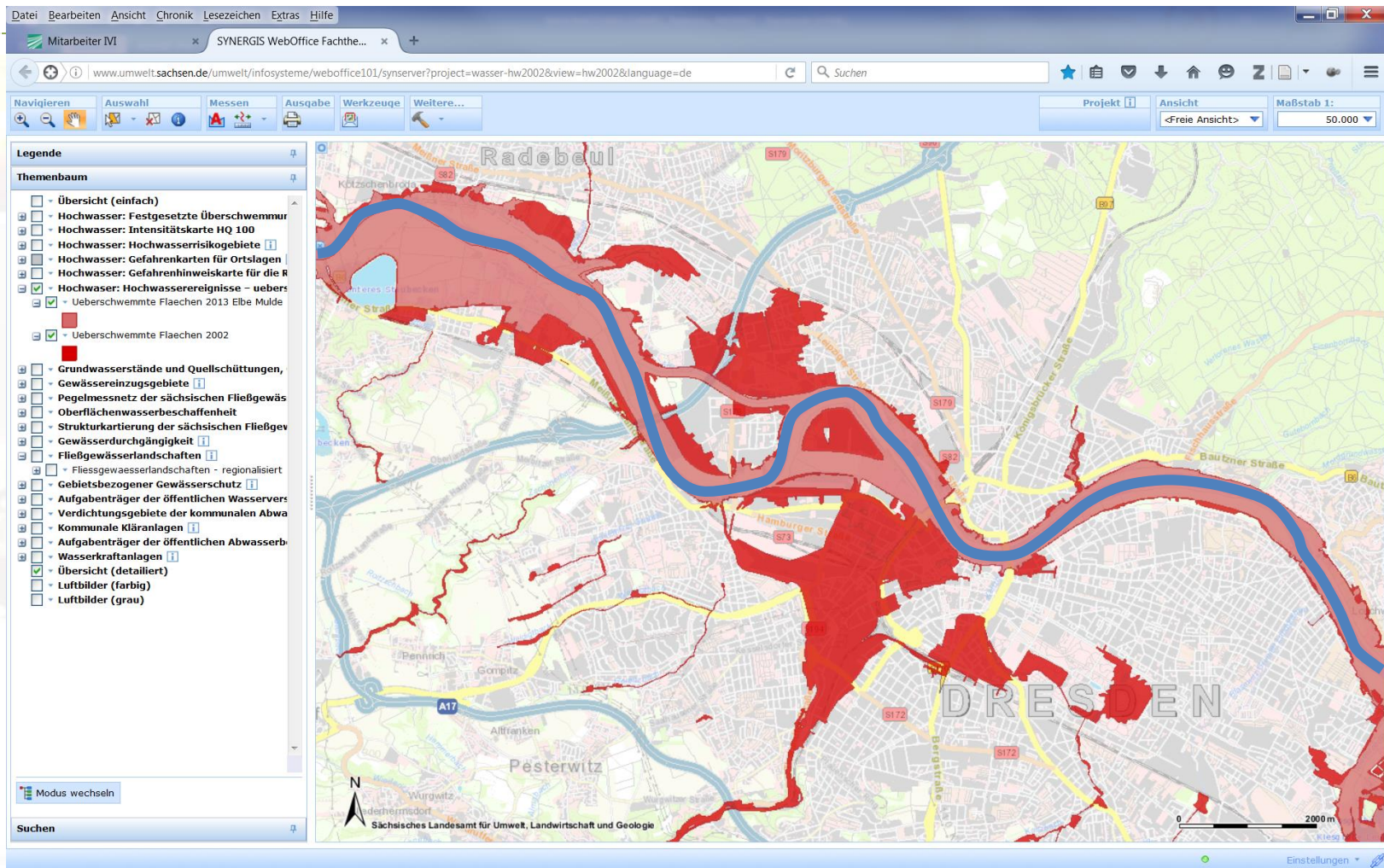
Map of region



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City of Dresden under flood 2002/2013



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Damage Free State of Saxony ' 2002

- Casualties: **21**
- Damage costs: **8,6 Billion EUR**
- Damaged buildings: **>25,000;**
400 totally destroyed
- Damaged roads: **540 km**
- Damaged social facilities: **280**
- Evacuations: **35,000**
(only City of Dresden)



Main railway station



Evacuation of hospital

Pictures: dresden-lexikon.de, khdn.de



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Case Study Flood

- **Climate and man-made triggers and drivers**
 - Extreme precipitation (caused by climate change) - increasing
 - Sealed surfaces – increasing
 - Flood retention spaces – decreasing
- **Infrastructures affected**
 - Roads closed, rail roads → blocking, re-routing
 - Housing → evacuations, public shelters
 - Electricity → replacement by powergens for public buildings
 - Telecommunication (some mobile providers, land-line) → individual replacement
 - Public buildings → evacuation, temporary quarters
 - Health care facilities → evacuation, replacement
 - Industry, retail, etc.: private issues

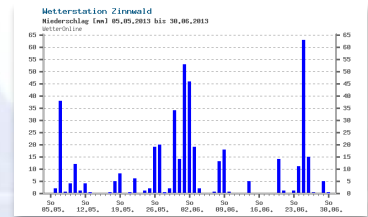


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Case Study Flood

- Existing data:
 - Areas flooded 1845, 2002, 2013
 - Current infrastructure (OpenStreetMap etc.):
 - ✦ Settlements, population/occupancy of buildings (partly)
 - ✦ Roads (topology), railroads,
 - ✦ public buildings, hospitals
 - ✦ Power stations (no topology)
 - Precipitation for weather stations (daily)
 - Water levels at gauging stations (daily)
 - Damage / costs for reconstruction from insurance association and government (state level, regions, cities)



Q
m³/s

Pegel : Dippoldiswalde 1+3
Gewässer : Rote Weißeritz
Gebiet : Obere Elbe

	2013					
	Mai	Jun	Jul	Aug	Sep	Okt
38	1.15	12.8	2.82	0.489	0.164	0.202
35	1.05	25.5	2.37	0.430	0.139	0.202
78	1.02	26.5	2.09	0.395	0.190	0.178
72	0.997	10.1	1.82	0.389	0.229	0.169
72	1.09	4.68	1.65	0.416	0.234	0.169
38	0.999	2.78	1.51	0.469	0.204	0.169
31	1.50	1.71	1.33	0.565	0.164	0.169
23	3.12	1.11	1.22	0.399	0.164	0.169
35	2.84	6.01	1.13	0.453	0.387	0.152
30	3.35	7.01	1.07	0.528	0.273	0.217

Sources: OSM,
wetteronline.de,
SMUL



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Case Study Flood

- Risk mitigation & adaptation measures already taken since '2002 (examples):
 - Flood barriers (walls, partly “mobile”)
 - New dikes
 - Retention spaces (renaturation and new constructions)
 - Emergency plans
 - Public warning and information system
 - Insurances?



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Policy questions

- Which benefit brings a new dike/extension?
 - reduction of damage costs
 - lowering of evacuation efforts
 - lowering of mobility/transport limitations
- Where should emergency resources be placed (powergens, pumps) optimally?
- At which level of the hazard, which area/how many people must be evacuated?
- Where should new settlements/industries be avoided?
- Predict „dimension“ of missions: How many basements must be pumped out?
- Comparisons of strategies: invest in emergency power generators vs. a new dike?
- What if:
 - ... it rains more frequent/more intensive (frequency ↑)?
 - ... multiple hazards occur simultaneous (severity ↑)?



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