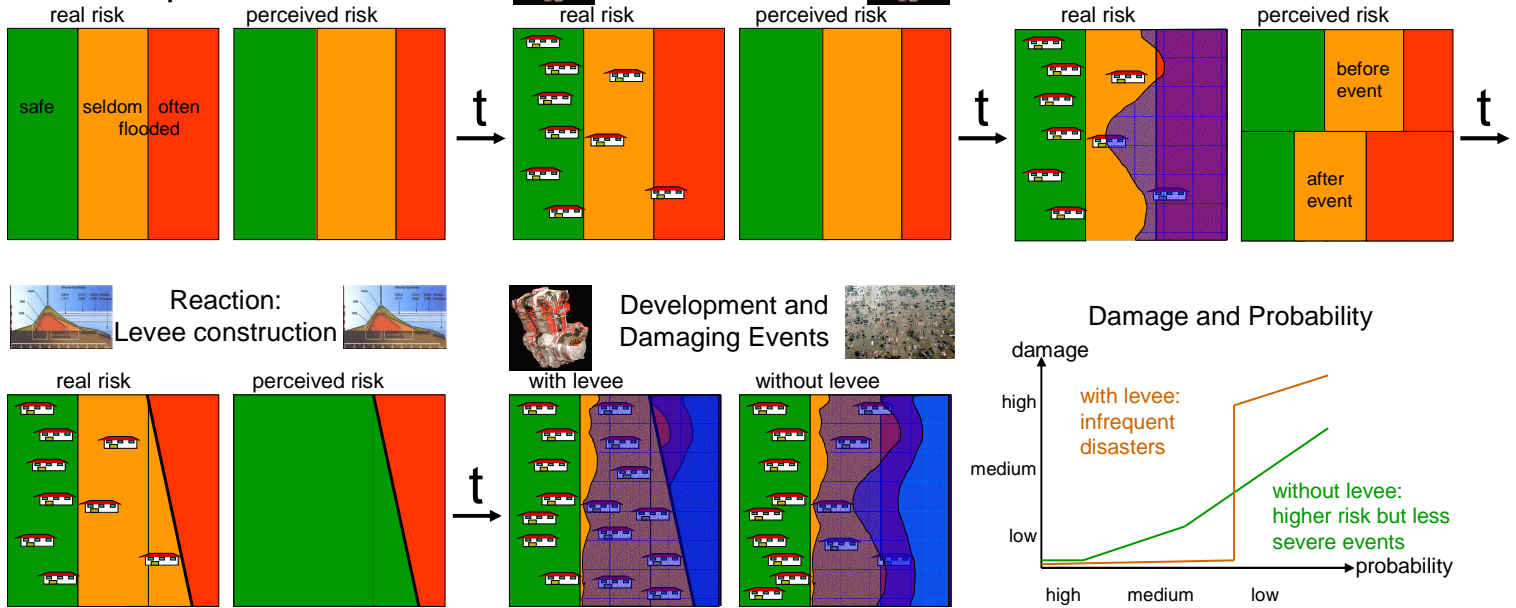


Description of the Safe Development Paradox

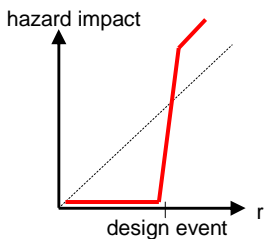


Safe Development Paradox in Literature

- **Fundamental:** Burby, Raymond J., "Hurricane Katrina and the Paradoxes of Government Disaster Policy: Bringing about Wise Governmental Decisions for Hazardous Areas," *Ann Am Acad Political Social Sci*, 2006, 171-191.
- **"Levee effect":** Burton, Ian, *Types of Agricultural Occupance of Flood Plains in the United States*, Univ. of Chicago Press, Chicago, 1962. Segoe, L., "Flood control and the cities." *American City*, 1937, 55-56.
- **Effects of danger zone mapping:** In the Austrian and Swiss Alps danger zone mapping leads to the highest growth rate of development directly at the edge of the building ban zone because people know where it is "safe" to build houses according to the danger zone plan. If for example climate change leads to a more severe hazard, the spatial planning system would have actually contributed to increasing the damage potential.
- Keiler, Margareth, "Development of the Damage Potential resulting from Avalanche Risk in the period 1950–2000, Case Study Galtür," *Natural Hazards and Earth System Sciences*, 2004, 249-256. Fuchs, Sven, Bründl, M. and Stötter, J., "Development of Avalanche Risk between 1950 and 2000 in the Municipality of Davos, Switzerland," *Natural Hazards and Earth System Sciences*, 2004, 263-275

Two Ways to Avoid the Paradox

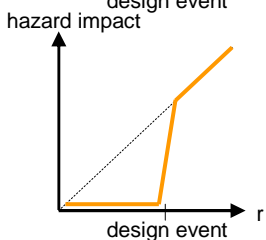
Develop or use mitigation measures which always have the effect of diminishing the hazard



Failure of measure leads to higher hazard impact.

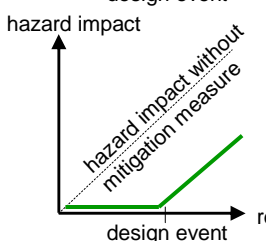
E.g. a flash flood at the Lainbach in 1990 destroyed all (!) torrent check dams and mobilized additional bed load.

Systematic analysis of structural measure failure is necessary, especially for big events!



Failure of measure leads to the same hazard impact.

E.g. levees, forests in the catchment area, drainage of land slide areas, consolidation dams at the toe of a landslide.



Failure of measure leads to smaller hazard impact.

E.g. debris retention constructions which are filled but do not break in a debris flow, bigger and deeper river beds, snow retention constructions

Mitigation measures should increase or at least maintain the awareness of people at risk

- Warning systems
- Mobile structures which must be erected during an event by people at risk => people notice the dangerous situation and the necessity of action
- Regularly inform the public about the danger:
 - show danger zones in reality
 - explain different scenarios for landslide or debris flow events
- Inhibit development of areas protected by technical measures
 - E.g. the spatial planning law of Tyrol which forbids development in the path of the hazard

Analysis of new integrated protection concepts is necessary including not only their technical feasibility but also their impact on public risk perception!

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