



Multi-Risk Aspects

Nicole Bischof

Content

- **BASICS** *Definition of Multi-Risk*
- **EXAMPLES** *of multi-risk studies*
- **FUNDAMENTALS** *Paradigm shifts and open questions*

A definition of multi-risk

Multi-risk can be considered as...

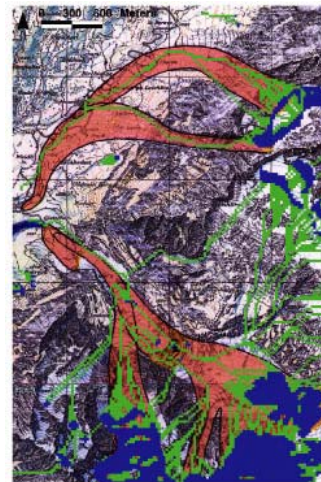
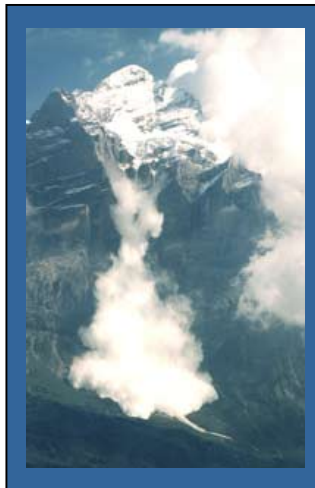
...synchronicity of various natural hazards, e.g. rapid mass movements. Characterized by the dimensions time (e.g. seasonal appearance) and place.



A definition of multi-risk

Multi-risk can be considered as...

...superposition of various hazards, e.g. rapid mass movements.
A common trigger, such as a high-intensity rainstorm or earthquake or previous hazard process releases a subsequent event.



The model is based on a simple assumption:
- overall slope > 31%

- glaciers with a modelled potential for producing ice avalanches
- modelled path ways of potential ice avalanches
- estimated path ways of potential ice avalanches based on field observations

Grindelwald Region, Swiss Alps

A definition of multi-risk

Multi-risk can be considered as...

... synchronicity of various hazards, e.g. technical hazards, man-made hazards, pandemics, etc..



A definition of multi-risk

Challenges of multi-risk approaches

- ✓ Multi-hazard and multi-risk approaches are usually not applied, only some exceptions
- ✓ multi-risk considerations as scientific approach, not yet applied to practice
- ✓ different details of data and different parameters
- ✓ difficult to apply to all spatial levels from regional to local
- ✓ diverse responsibilities of sectoral planning divisions for different natural hazards

A definition of multi-risk

Need for multi-risk approaches

- ✓ *Most European regions are characterized by the presence of multiple natural and technological risks in an area. However, systematic consideration of multiple risks by spatial planning remains a major challenge.*
- ✓ *Decision makers (e.g., disaster management agencies, urban planners, insurers, regional and local authorities) need comprehensive comparable information which includes all relevant hazards types within a region.*
- ✓ *Quantitative comparisons of hazard assessment results are difficult due to different parameters, thus the multi-hazard approach has to be enlarged by the multi-risk approach.*

Examples of multi-risk studies

Awareness of necessity for comparative synoptic multi-risk studies has recently enlarged, thus the number of examples rises:

- UNDR0 study for Manila (1977)
- KATANOS and KATARISK reports for Switzerland (BZS, 1995 and 2003)
- AGSO Cities project for geohazards in Australian urban communities (e.g. Granger et al., 1999)
- Turrialba, Costa Rica (van Westen et al., 2002)
- Toronto, Canada (Ferrier and Haque, 2003)
- EU-project Armonia (e.g. Walker and Deeming 2006)
- Cedim Risk maps for Germany (e.g. Grünthal et al., 2006)
- EU-project Espon (e.g. Olfert et al. 2006)
- GRINP project at Mount Cameroon (Thierry et al., 2008)

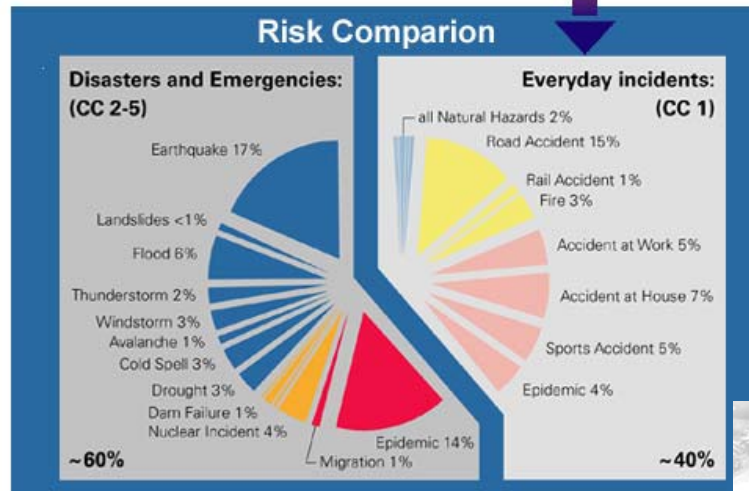
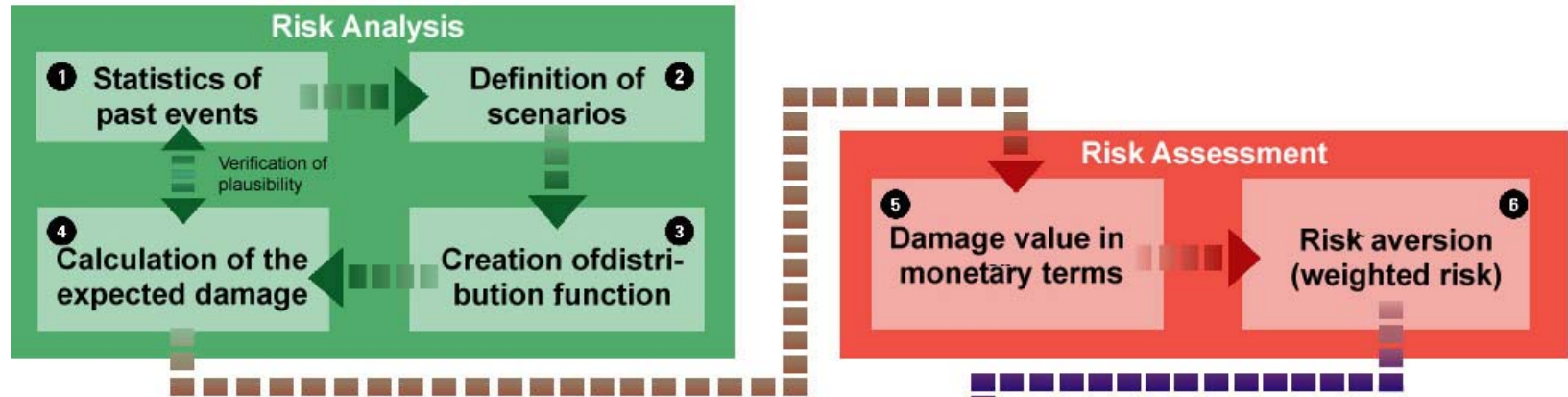
EXAMPLES: Katarisk

- ✓ Conducted by the Federal Office for Civil Protection
- ✓ A comparative overview of disasters and societal emergencies in Switzerland
- ✓ disasters and emergencies, which could harm Switzerland and their significance in terms of disaster and emergency relief



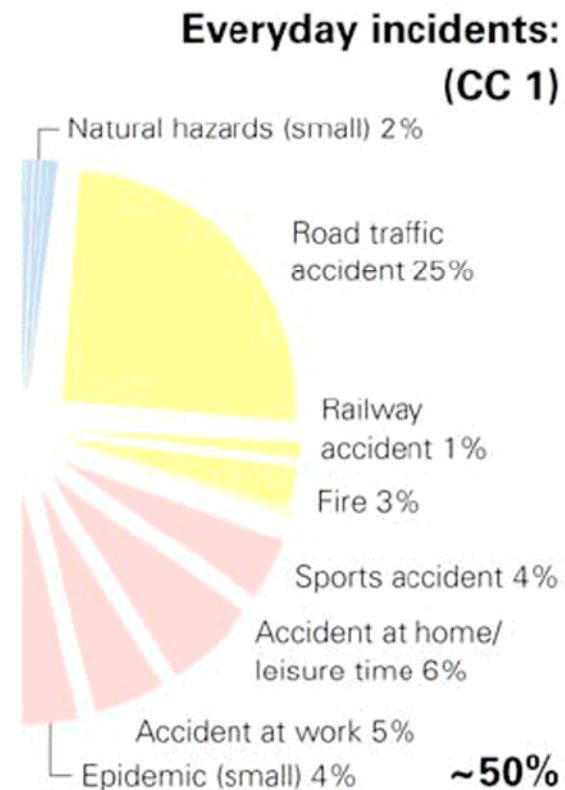
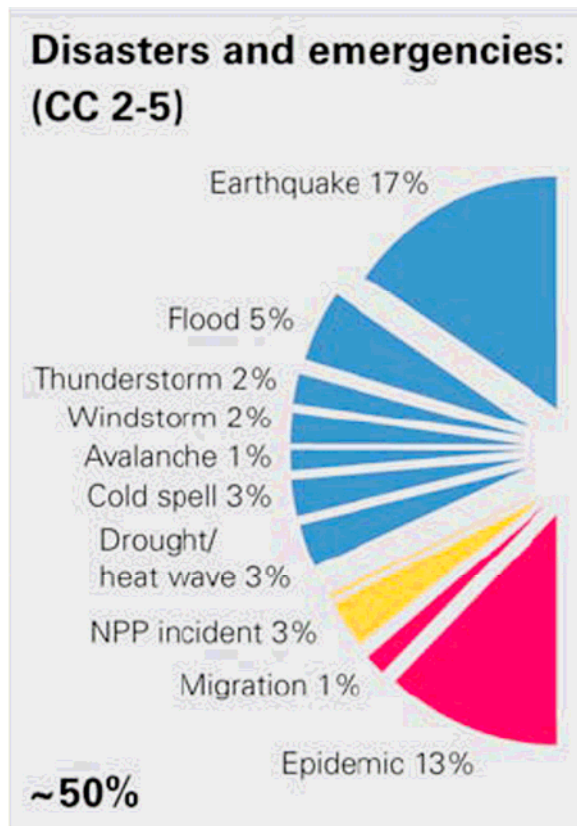
EXAMPLES: Katarisk

Approach



EXAMPLES: Katarisk

Risk comparison



EXAMPLES : Armonia

The need for a multi-hazard, multi-risk land management decision support system was justified through a literature review, as no system which methodically considers both quantitative and qualitative multi-risk effects currently exists.

→ Multi Risk Land Use Management Support System (MURLUMSS)

It maps and visualises information on up to

- ✓ 5 different natural hazards and risks as well as
 - ✓ different forms of vulnerability and
 - ✓ coping capacity
 - ✓ at both regional and local levels.
- multi-scale, multi-risk and multi-vulnerability characteristics



EXAMPLES : Armonia

Multi Risk Land Use Management Support System (MURLUMSS) allows:

- ✓ Multiple outputs (scenarios) are envisaged to be capable of *informing a*
- ✓ diverse decision-making forum about the uncertainties inherent in
- ✓ managing environmental and social vulnerabilities, in the presence of
- ✓ sometimes contradistinctive hazard effects.



EXAMPLES : Armonia

The screenshot displays the Armonia software interface. At the top left, the title "REGIONAL COPING CAPACITY" is visible. Below it, a menu bar includes "File", "Save as", "Export", and "Help". A note in the top right corner states "Map for illustration purposes only".

The main map area shows a geographical region with a color-coded coping capacity index. A red circle highlights a specific Area of Interest (AOI). A text box explains: "Index layers display census area coping capacity in single colour. Coping capacity must be assessed at regional and not AOI scale due to 'edge effects' i.e. resources in neighbouring areas may be used to provide assistance across the boundaries; such support could not be assessed if only the AOI were analysed".

On the left side, there are several layers and options:

- Regional Coping Capacity** (selected)
- Emergency equipments INDEX
- Infrastructures and road networks INDEX
- Accessibility INDEX
- Emergency Equipment (points with radius of influence)

 - Police
 - Fire
 - Medical
 - Hospital
 - Clinic

- Infrastructures and road Networks (lines)

 - Infrastructure
 - Regional
 - Urban
 - Local
 - Road
 - National
 - Regional
 - Highway

At the bottom left, a zoom level of "10" is shown. At the bottom center, a legend titled "Index Class" shows four categories with corresponding colors:

Index Class	Color
1 (L)	Orange
2	Green
3	Light Green
4 (H)	Pink

At the bottom right, there are navigation buttons: "QUIT", "BACK", and "NEXT".



EXAMPLES : Armonia

Multi Risk Land Use Management Support System (MURLUMSS)

Case Studies:

- ✓ Has been applied to Tuscany region, Italy and to England & Wales
- ✓ Methodology requires further validation
- ✓ Decision makers require risk metrics that are quantifiable (e.g. economic damage, potential loss of life)
- ✓ Further research is necessary into what the end users of risk maps actually require. Currently hazard maps are widely used, but some need quantifiable risk metrics to evaluate mitigation measures.



EXAMPLES : Multirisk study Germany

Synopse of natural hazards in Saxonia, Germany:

- ✓ Consistent comparison of risks due to natural hazards (storm, flood, earthquake)
- ✓ Consistent type of damage (residential houses)
- ✓ Indicators: risk curves, expected amount of damage
- ✓ Loss of life
- ✓ No interaction of hazards



*Acknowledgments: B. Guse, G. Grünthal, H. Kreibich, K. Poser, A. Thieken
GeoForschungsZentrum Potsdam
D. Borst, P. Heneka, Th. Hofherr, B. Khazai, S.M. Murshed, S. Tyagunov
Universität Karlsruhe (TH)*



Universität Karlsruhe (TH)



Irasmus Symposium „A Merge of Theory and Practice“ May 15-16, 2008



EXAMPLES : Multirisk study Germany

Synopse of natural hazards in Saxonia, Germany:

- ✓ Goal: compareable risk assessment for whole Saxony
- ✓ Problems: unequal niveaus of probabilities



Universität Karlsruhe (TH)

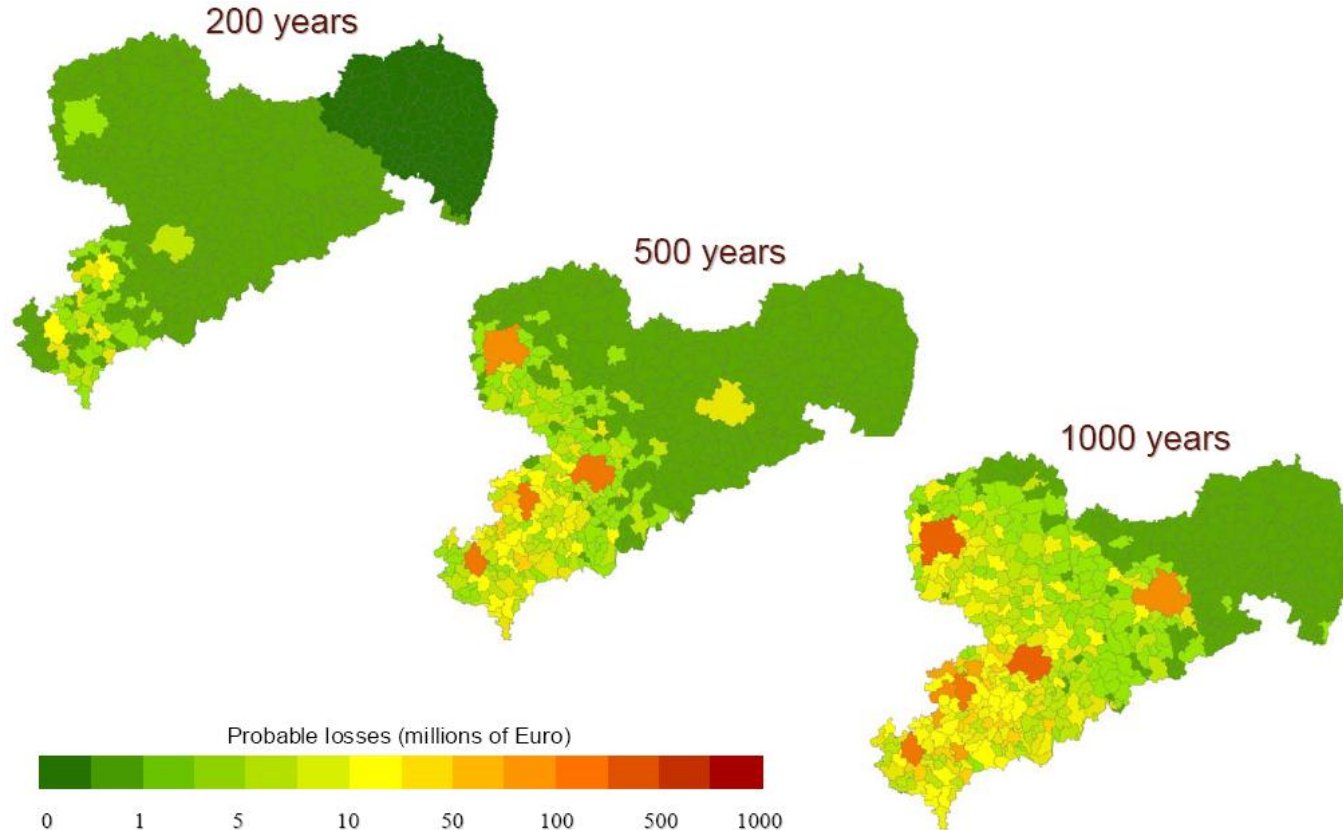


Irasmus Symposium „A Merge of Theory and Practice“ May 15-16, 2008



EXAMPLES : Multirisk study Germany

Earthquakes: Probable losses due to damage to residential buildings



Universität Karlsruhe (TH)

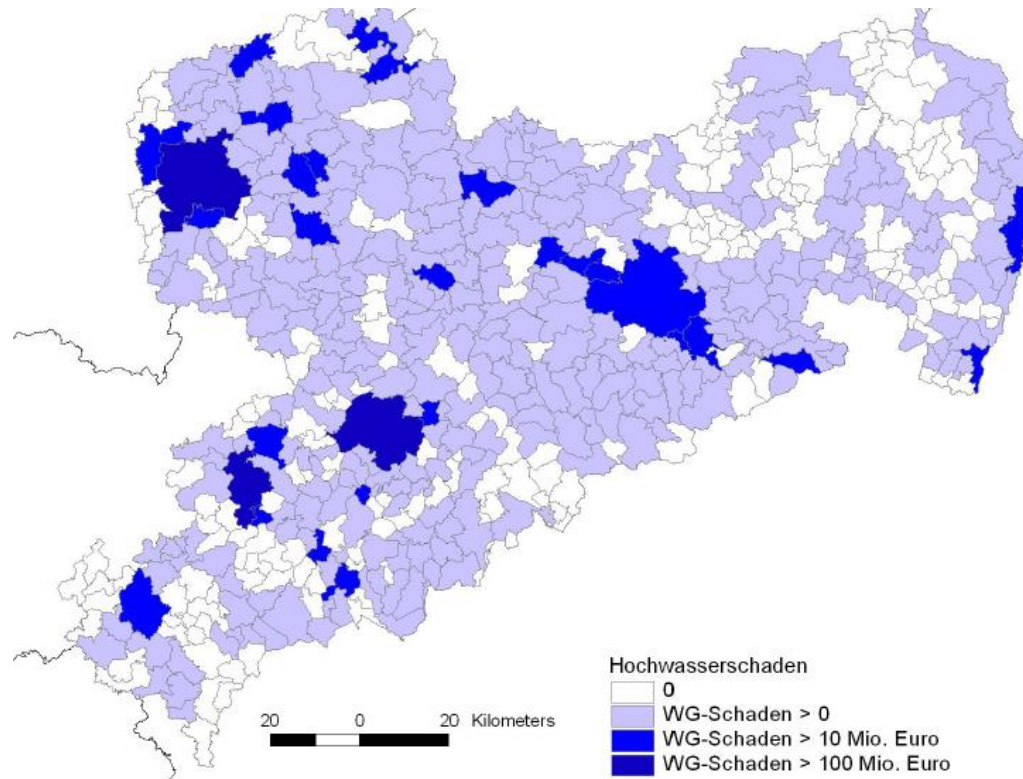


Irasmus Symposium „A Merge of Theory and Practice“ May 15-16, 2008



EXAMPLES : Multirisk study Germany

Flood: Probable losses due to damage to residential buildings.
Example of HQ200/300



Universität Karlsruhe (TH)



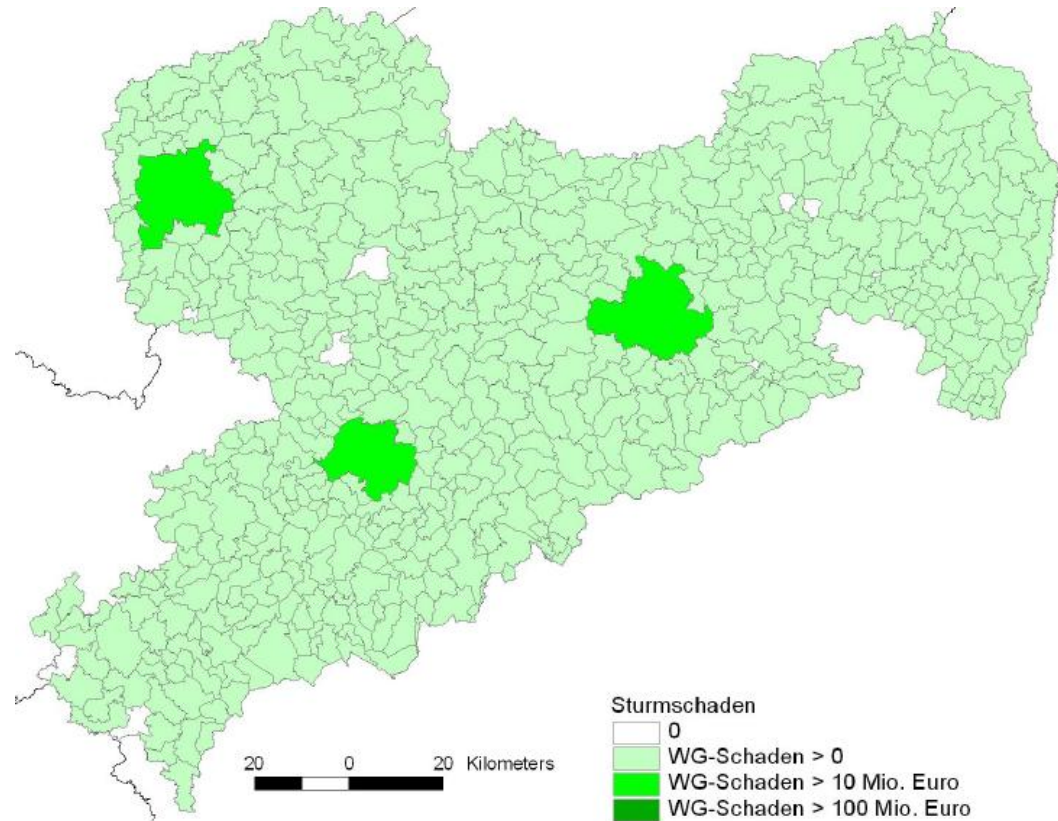
Irasmus Symposium „A Merge of Theory and Practice“ May 15-16, 2008



EXAMPLES : Multirisk study Germany

Storm: Probable losses due to damage to residential buildings.

Example ST 200.



Universität Karlsruhe (TH)



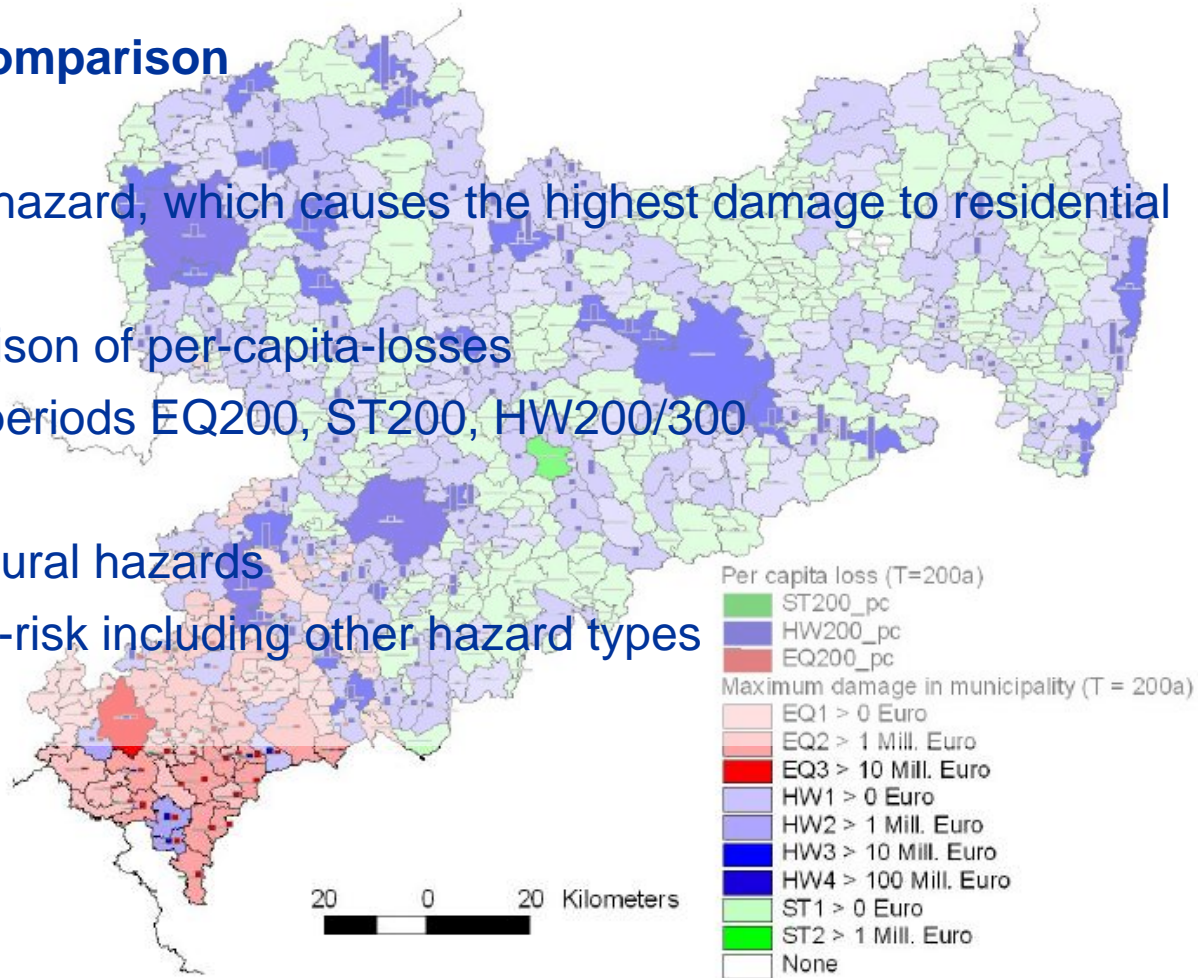
Irasmus Symposium „A Merge of Theory and Practice“ May 15-16, 2008



EXAMPLES : Multirisk study Germany

First risk comparison

- ✓ Natural hazard, which causes the highest damage to residential houses
- ✓ Comparison of per-capita-losses
- ✓ Return periods EQ200, ST200, HW200/300
- ✗ Only natural hazards
- ✗ No multi-risk including other hazard types



Universität Karlsruhe



Irasmos Symposium „A Merge of Theory and Practice“ May 15-16, 2008



FUNDAMENTALS

A multi-risk perspective is not easily taken on by sectoral planning divisions who typically have a focus on particular forms of hazards. → *multi-risk in the dimension ,content‘*

It can however be understood naturally as a task for spatial planning, which is concerned about all potential threats to a given spatial area and their possible interaction. → *multi-risk in the dimension of ,space‘*

Also further developments of existing risks and new upcoming hazards should be incorporated into a holistic multi-risk approach. → *multi-risk in the dimension of ,time‘*

FUNDAMENTALS

- ✓ Paradigm shift from hazard prevention to risk management
- ↘ The shift from single risk management to integral, multi-risk management has still to be done
- ↘ Beyond natural hazards: all types of risks have to be considered in an integral multi-risk approach



Thank you for your attention!

Contact: Nicole Bischof, bischof@slf.ch