




## The CHANGES project: analyzing changing hydro-meteorological risk

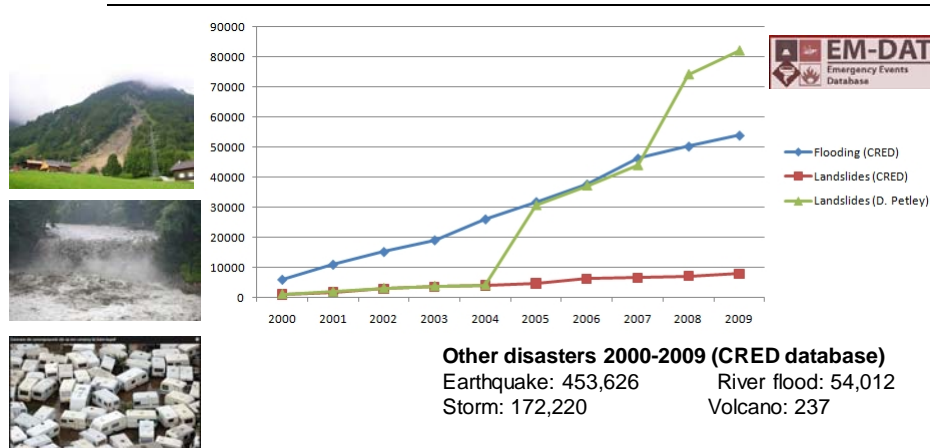
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 Science and Earth  
 Observation  
 ITC, University of Twente, The  
 Netherlands  
 E-mail: [westen@itc.nl](mailto:westen@itc.nl)



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### Comparing historical data on floods and landslides fatalities



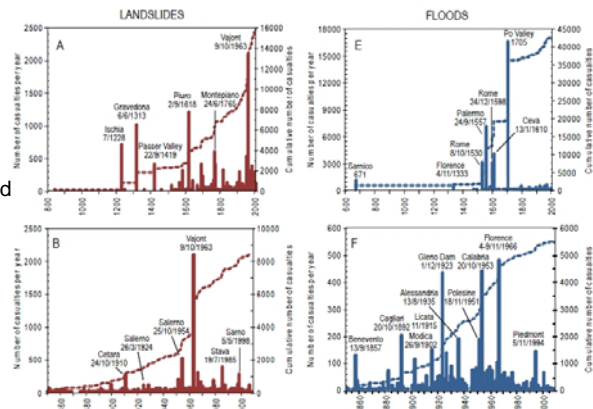
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### Example: Historical analysis of landslides and floods in Italy

- In Italy a database was constructed of historical damaging events over the last 2000 years, with 3139 landslide events and 2595 flood events.
- the number of landslide and flood events per unit time (i.e., per year) increases with time
- the severity varies with time
- Same sites are affected but damage in same site is less frequent



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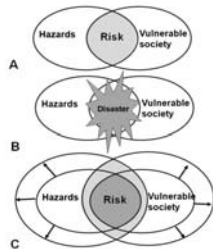


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P. Salvati, C. Bianchi, M. Rossi, and F. Guzzetti, Societal landslide and flood risk in Italy. *NHESS* 10, 2010

## Trends in disasters

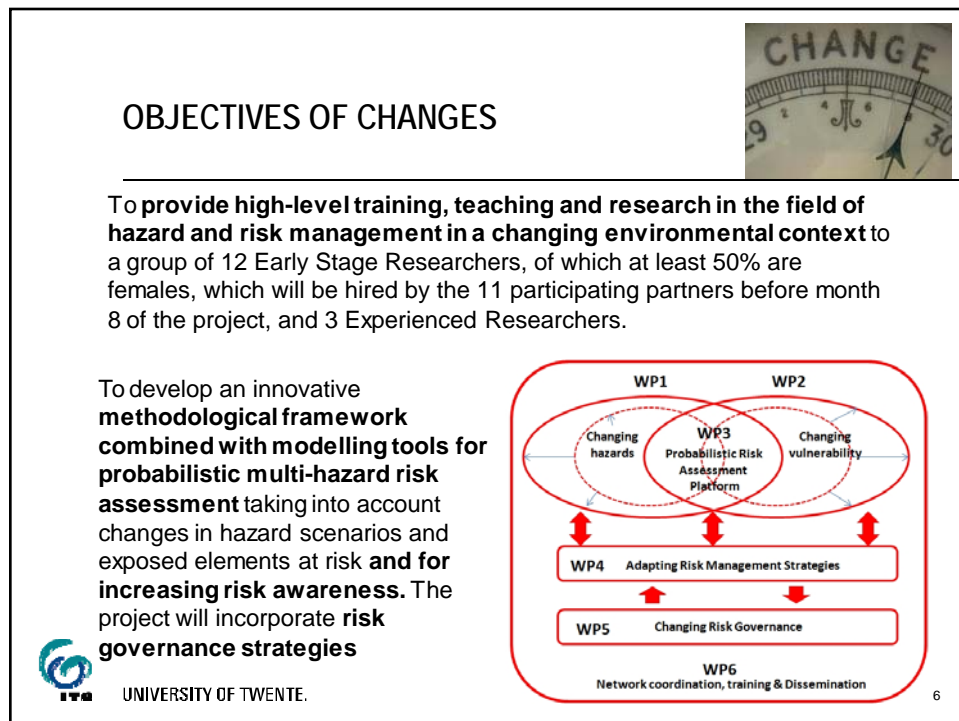
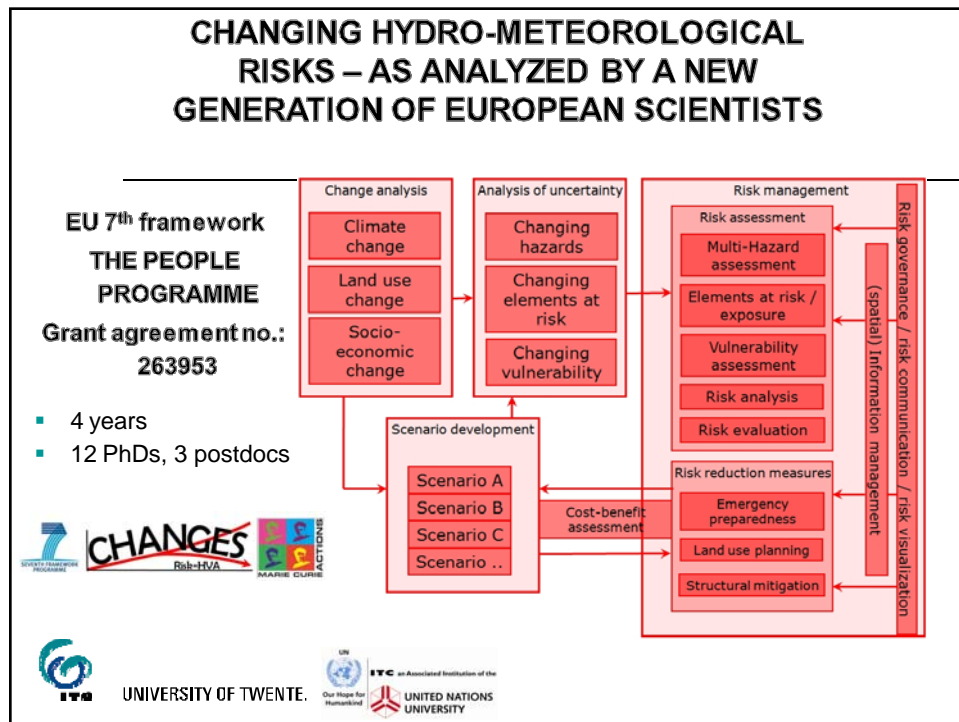
- Increasing frequency
  - Especially of hydrometeorological events
- Increasing economic losses
- Increasing number of people affected
- Decreasing number of people killed



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**CHANGES**  
Rhb-HVA



**ACTIONS**  
MARIE CURIE

## PARTNERS IN CHANGES PROJECT





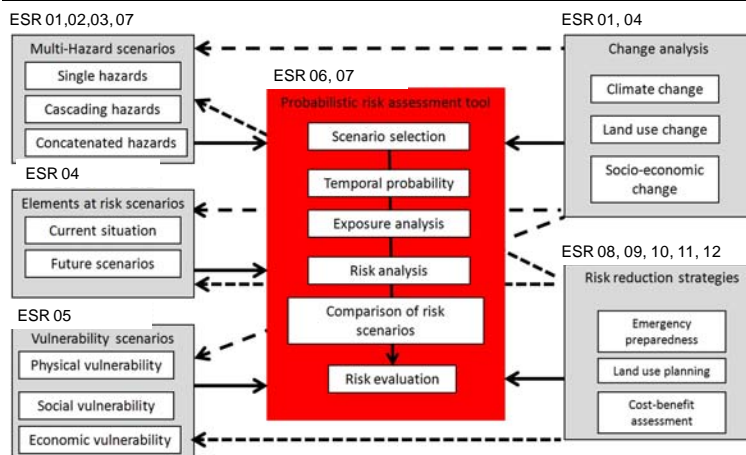

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### The Early Stage Researchers (PhD positions)

ESR01	ITC	Thea Turkington	New Zealand
ESR02	Z-GIS	Korbinian Breinl	Germany
ESR03	CNRS	Romy Schlögel	Belgium
ESR04	IIASA	Ziga Malek	Slovenia
ESR05	UNIVIE	Roxana Liliana Ciurean	Romania
ESR06	CNR	Haydar Hussin	Netherlands
ESR07	IGRAC	Veronica Zumpano	Italy
ESR08	IRM	Kathrin Prenger-Berninghoff	Germany
ESR09	UNIL	Zar Chi Aye	Myanmar
ESR10	CNR	Vivian Juliette Cortes Arevalo	Colombia
ESR11	TUDO	Teresa Sprague	USA
ESR12	TUD	Marie Charrière	Swiss

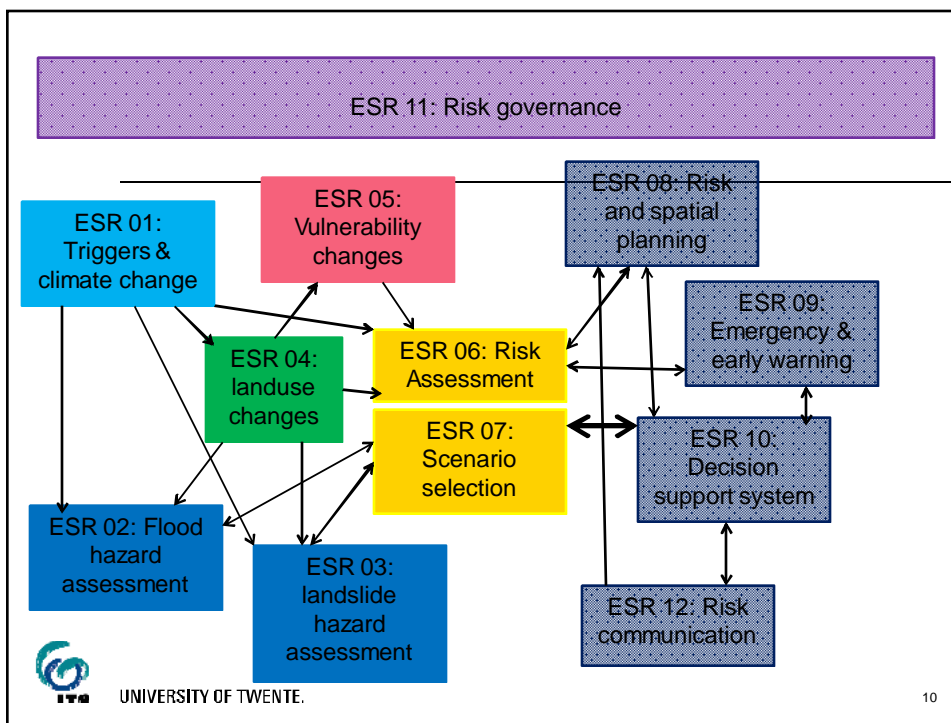


## RELATION BETWEEN RESEARCH THEMES



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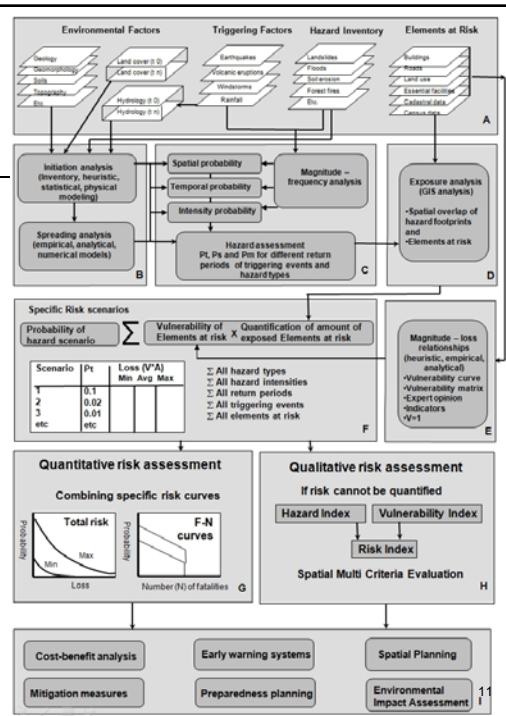
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## RISK ASSESSMENT

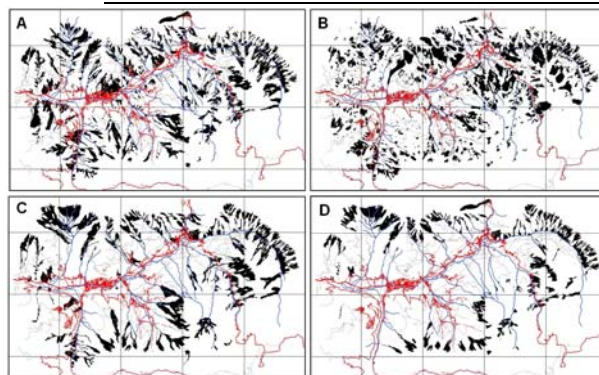
- A: Input data  
 B: Susceptibility assessment  
 C: Hazard assessment  
 D: Exposure analysis  
 E: Vulnerability assessment  
 F: Risk assessment  
 G: Quantitative risk  
 H: Qualitative risk  
 I: Risk reduction



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## HAZARD MODELING: MASS MOVEMENTS

DEBRIS FLOWS, LANDSLIDES, ROCKFALL, SNOW AVALANCHES



A: debris flows, B: landslides, C: rockfall and D: snow avalanches

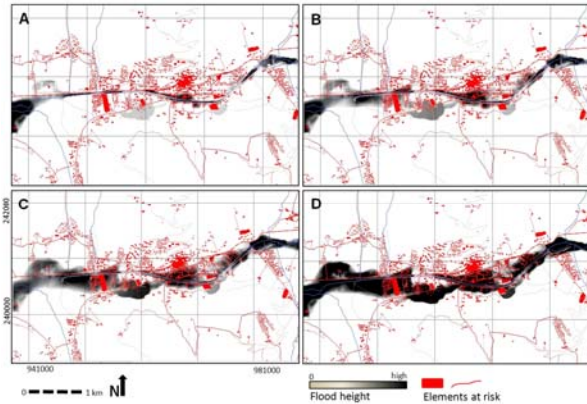
- Run different scenarios (major, moderate, minor events)
- Initiation areas using the output of the source area maps.
- Define parameters for runout: reach angles
- Runout model calculates:
  - Extend of the runout
  - Kinetic energy converted to impact pressure



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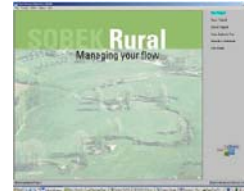
## HAZARD MODELLING: FLOODS



A: 150 year, B: 250 year, C: 500 year, D: 1000 year return period



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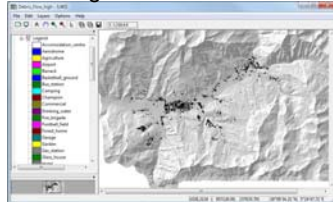


- Flood modeling using 1D-2D hydrodynamic model.
- Input data:
  - DEM (!!)
  - Surface roughness
  - (include buildings)
  - Discharge (return periods)
  - Boundary conditions

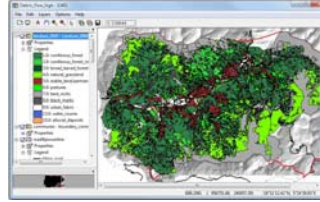
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## Elements at risk and vulnerability

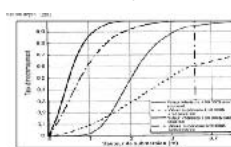
Buildings



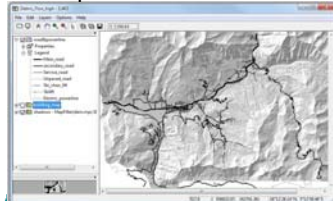
Land use



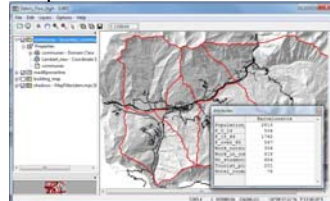
Vulnerability curves



Transportation infrastructure



Population



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## KEY COMPONENTS OF THE CHANGES PROJECT

- **Changing risk** : what are the changes expected in risk levels due to:
  - Climate change
  - Land use change
  - Socioeconomic changes
- **Multi-hazard risk**: the probability of occurrence of potential damaging phenomena of different types and their interactions within a given area and a given time period
  - Cause - effect relationships (concatenated hazards)
  - 'multi-risk' index may be often significantly higher than the simple aggregation of single risk indexes calculated considering each source as independent from the others



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## COURSES AND WORKSHOPS

### Professional skills course

	Name	Time/Place
PS-01	Research work plan development and scientific writing	M+9, Poland
PS-02	Research ethics	M+9, Poland
PS-03	Valorisation of scientific results	M+18, Italy
PS-04	Dissemination of scientific results to the public	M+16, Austria (&EGU)
PS-05	Writing research grant proposals	M+21, Romania
PS-06	Project management	M+43 Switzerland

### Technical skills course

	Name	Time
TS-01	Probabilistic risk assessment	M+9 Poland
TS-02	Monitoring and prediction of environmental changes.	M+21 Romania
TS-03	Web-GIS and Spatial Data Infrastructure	M+24 France
TS-04	Tools for risk Management	M+28 Austria (&EGU)
TS-05	Use of risk information in Spatial Planning	M+33 Italy

### Topical workshops

	Name	Time
WS-01	Risk governance implications of changing risks	M+18 Italy
WS-02	Environmental changes	M+30 France
WS-03	Modelling changes in hazard and risk	M+24 France
WS-04	Changes in Risk Management	M+33 Italy
WS-05	Web-based platform	M+43 Switzerland

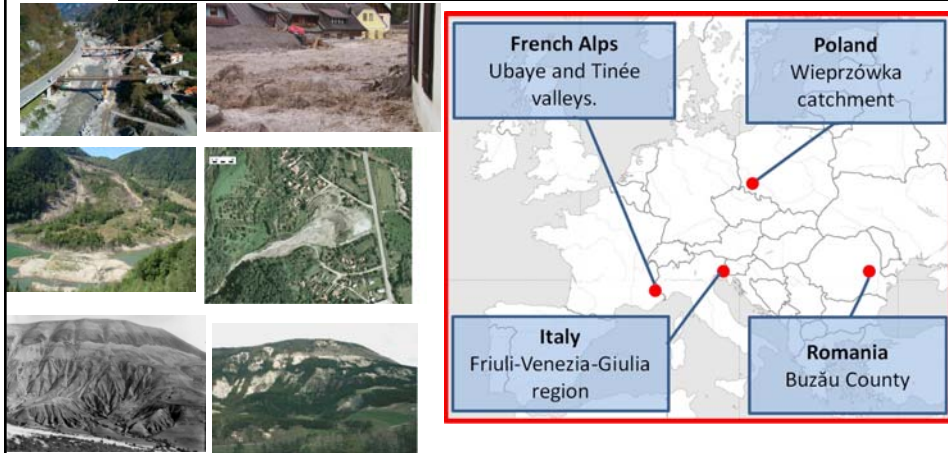


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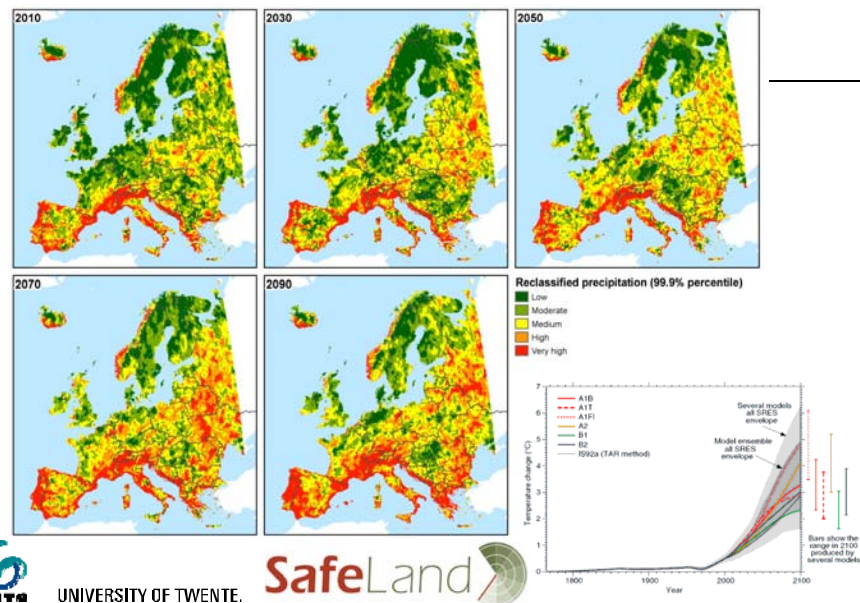
## STUDY AREAS



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## SAFELAND - CLIMATE SCENARIOS

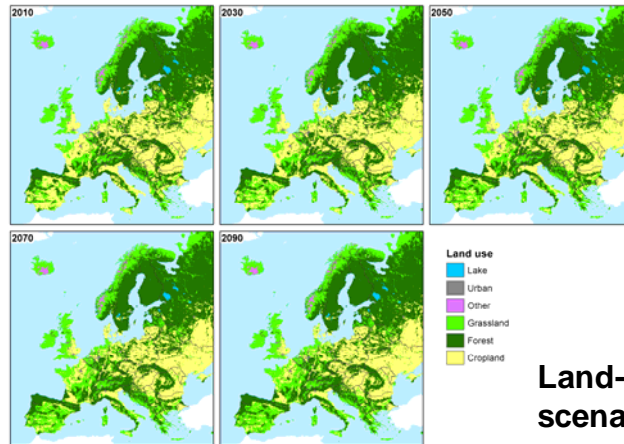


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## SAFELAND – LAND-USE CHANGE



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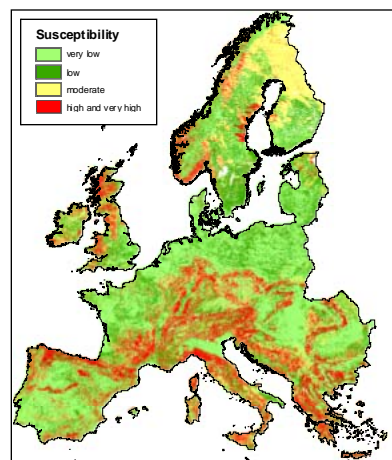
## SAFELAND – LANDSLIDE HAZARD

Changes in landslide hazard, 2010-2090



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Landslide susceptibility map



Gunther et al., 2011

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## WEBSITE & FLYER

WWW.CHANGES-ITN.EU

Home research network people study areas meetings training publications recruitment contact

**Changing Hydro-meteorological Risks – as Analyzed by a New Generation of European Scientists**

A Marie Curie Initial Training Network – Jan 2011 to Dec 2014

**Login**

External links

Marie Curie Actions  
Marie Curie Fellows  
EC FP7 programme

**Next event:**

5 April 2011: Project meeting in Vienna.  
19-23 September: courses in Krakow.

Funded by the European Community's 7th Framework Programme FP7/2007-2013 under Grant Agreement No. 203953

**About CHANGES**

The CHANGES network will develop an advanced understanding of how global changes, related to environmental and climate change as well as socio-economical change, will affect the temporal and spatial patterns of hydro-meteorological hazards and associated risks in Europe; how these changes can be assessed, modeled, and incorporated in sustainable risk management strategies, focusing on spatial planning, emergency preparedness and risk communication.

The main objectives are:

- (1) provide high-level training, teaching and research in the field of hazard and risk management in a changing environmental context to European young scientists;
- (2) reduce the fragmentation of research on natural processes, and
- (3) to develop a methodological framework combined with modeling tools for probabilistic multi-hazard risk assessment taking into account changes in hazard scenarios (related to climate change) and exposed elements at risk.

The HCITN is inter-disciplinary and inter-sectoral by its nature. Active stakeholders' participation and the dissemination of the project results are important features of the project. High-level training facilities as well as scientific and technological excellence will be provided to the next generation of researchers in the field of hazard and risk management.

www.changes-itc.eu

Changing Hydro-meteorological Risks – as Analyzed by a New Generation of European Scientists

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# Thank you for your attention

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