



Date: 25-26 April 2017

Place: University of Aalborg

Knowledge FOR Resilient soCiEty

**MODALITY OF UNIVERSITY-INDUSTRY/PUBLIC BODIES
COOPERATION IN THE FIELD OF DRM&FPE**

***Ss. Cyril and Methodius University
Faculty of Civil Engineering
Institute for Earthquake Engineering and Engineering
Seismology***

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained



Prof. PhD Violeta Mircevska Velkovska

Co-funded by the
Erasmus+ Programme
of the European Union





IZIIS-Skopje, View from Vodno Mountain



IZIIS- Under the auspices of UNESCO

Co-funded by the
Erasmus+ Programme
of the European Union





Skopje Earthquake, 26 July 1963
Time: 5:17am M=6.1

Co-funded by the
Erasmus+ Programme
of the European Union





***IZIIS – Institute of Earthquake Engineering and Engineering Seismology
was established in 1965 within University "Ss. Cyril and Methodius", Skopje***

- **United Nations International Consultative Board for Repair and Reconstruction of Skopje,**
- **UNDP- United Nation Developing Program**
- **UNESCO- United Nations Educational, Scientific and Cultural Organization**



Isolator in action

Co-funded by the
Erasmus+ Programme
of the European Union



IZIIS strategic orientation



- 1) Research, development, education and training in main fields of earthquake engineering and engineering seismology**
- 2) Assistance (to the Governments) in mitigating the earthquake consequences and post-disaster recovery**
- 3) Development and improvement of technical regulations, standards and codes**
- 4) Laboratory and field testing for defining technical base of earthquake risk reduction**
- 5) Seismic monitoring and disaster forecasting**
- 6) Promotion of a risk prevention culture, general public and community awareness and participation**
- 7) Consulting services in design of important engineering structures**





**IZIIS activities are in compliance with UNESCO
mission and contribution to safety and prosper of UN**



Co-funded by the
Erasmus+ Programme
of the European Union



SCOPE OF ACTIVITIE

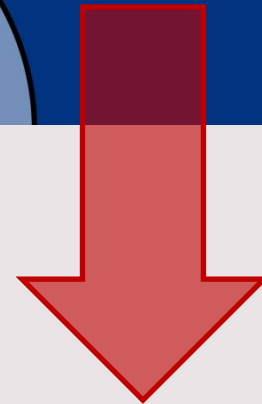
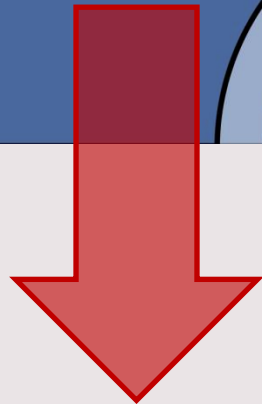




EDUCATION

TRAINING

IZIIS



Postgraduate Studies for

- **Master of Technical Science**
- **Doctor of Technical Science**

Long and short term courses

Collaboration whit industry, companies



Co-funded by the
Erasmus+ Programme
of the European Union





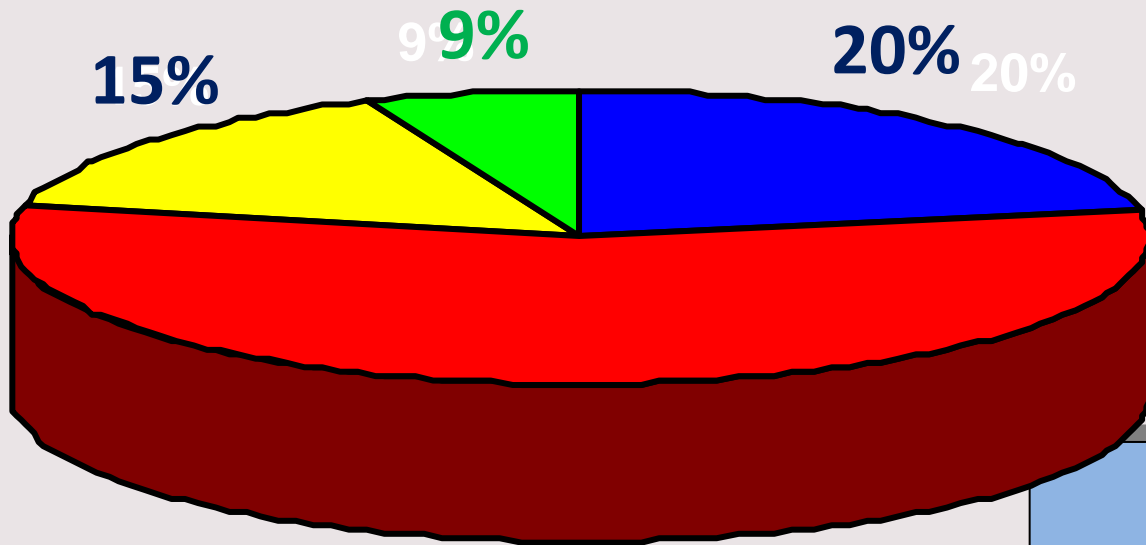
EARTHQUAKE ENGINEERING

International Course Sponsored by Dutch Government

IZIIS - CADAAC
COURSE



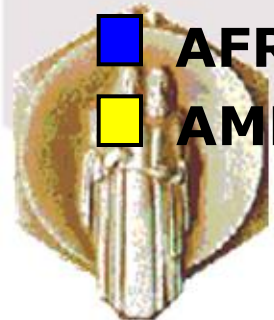
26 years of CADAC



520 PARTICIPANTS

26 CADAC's

26 YEARS

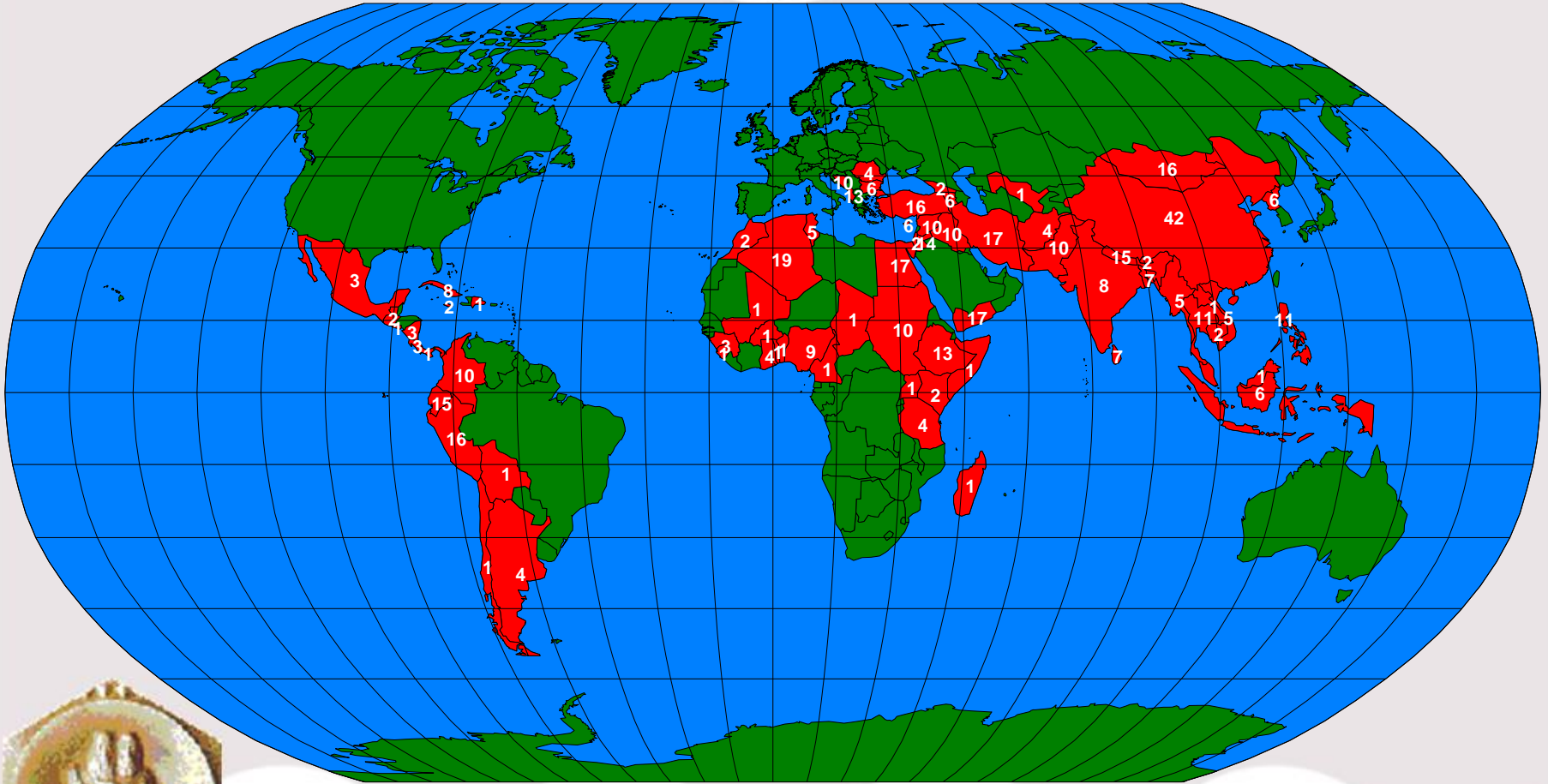


- AFRICA**
- AMERICA**
- ASIA**
- EUROPE**





Participants from 74 countries





CADAC Moments...





Assistance in mitigation of earthquake consequences ; post-disaster recovery



IZIIS team visiting a site stricken by the 1999 IZMIT earthquake (post disaster assistance)

Co-funded by the Erasmus+ Programme of the European Union





PAKISTAN: KASHMIR EARTHQUAKE 2005

Erasmus+ Programme
of the European Union

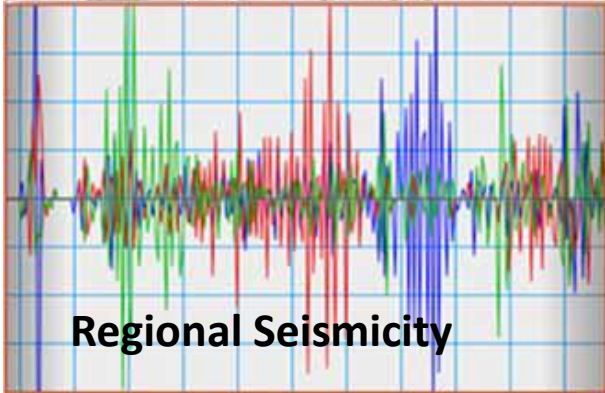




Co-funded by the
Erasmus+ Programme
of the European Union

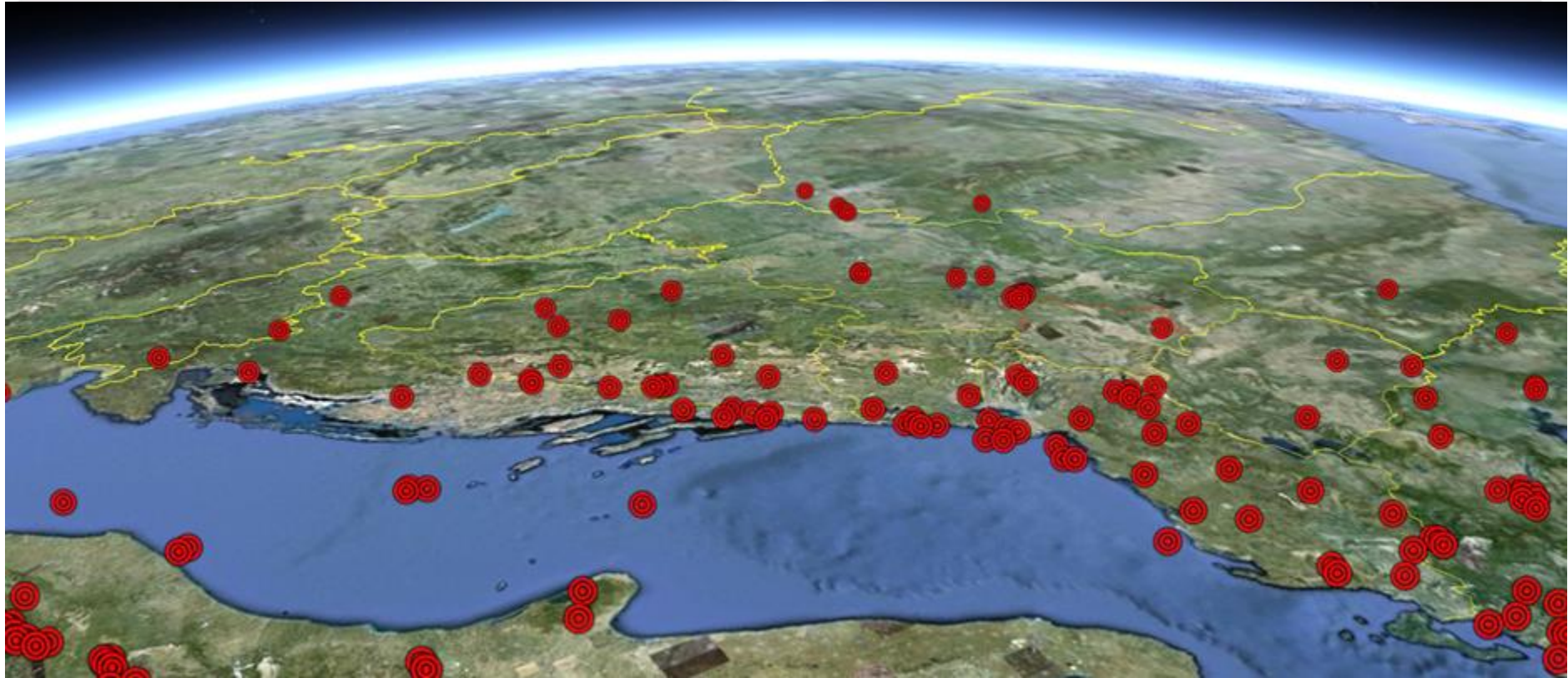


Natural hazards



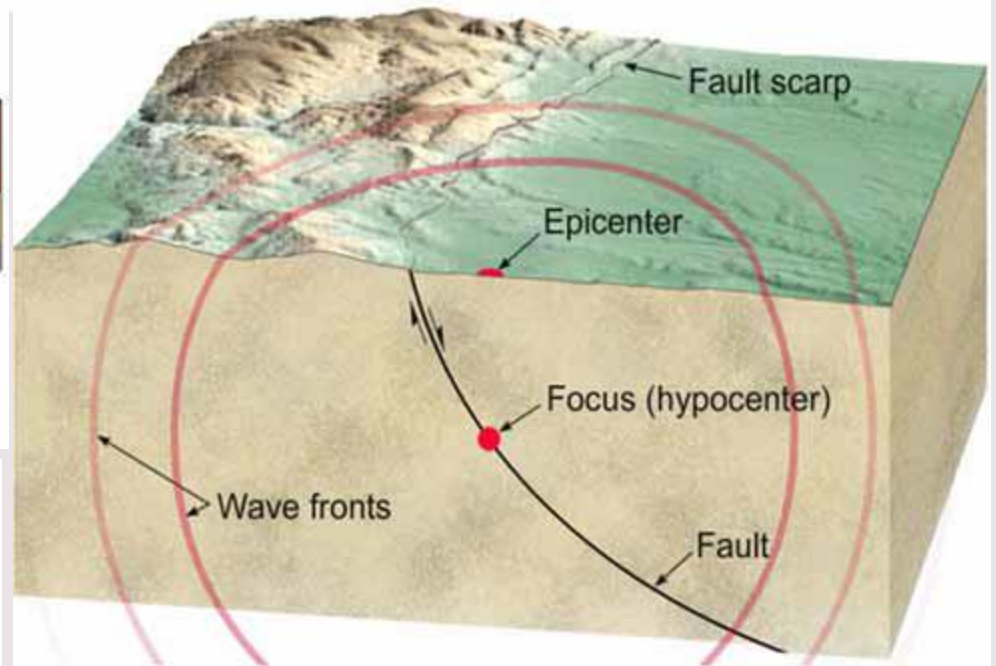
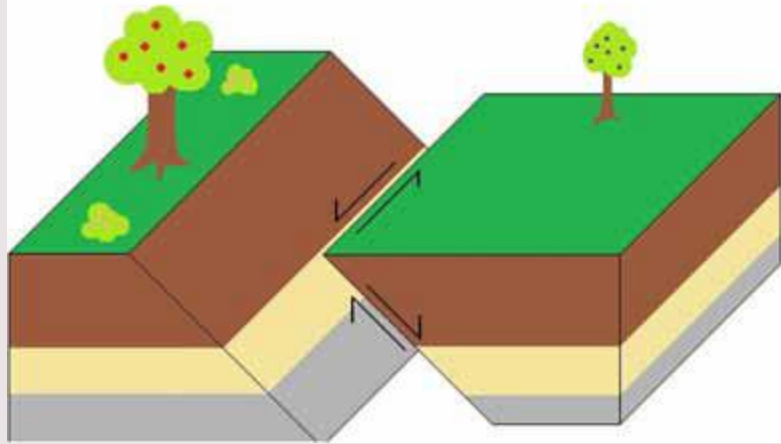


Seismic hazard mapping of the Balkans

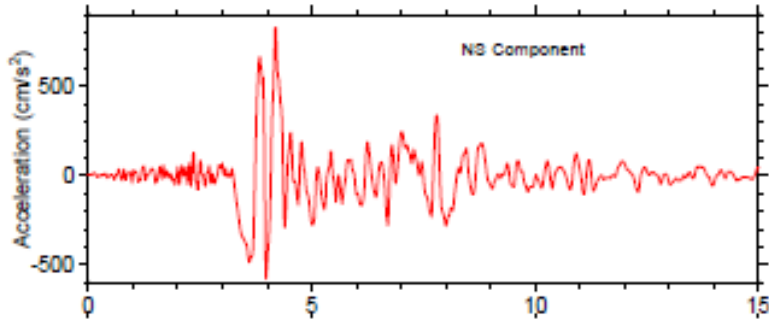


Co-funded by the
Erasmus+ Programme
of the European Union

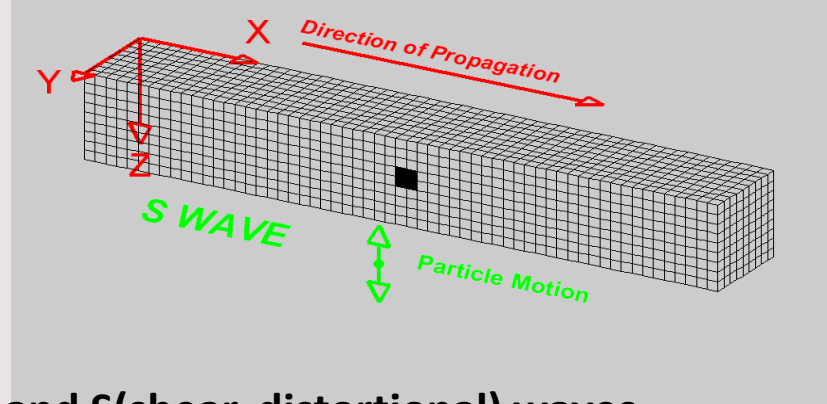
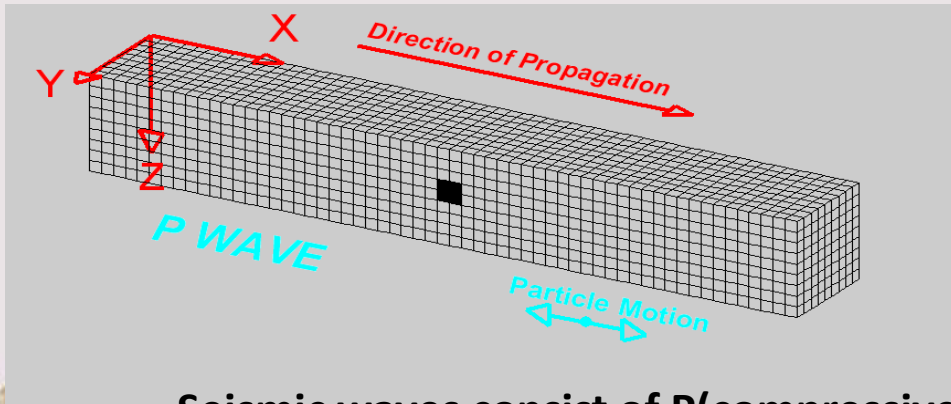
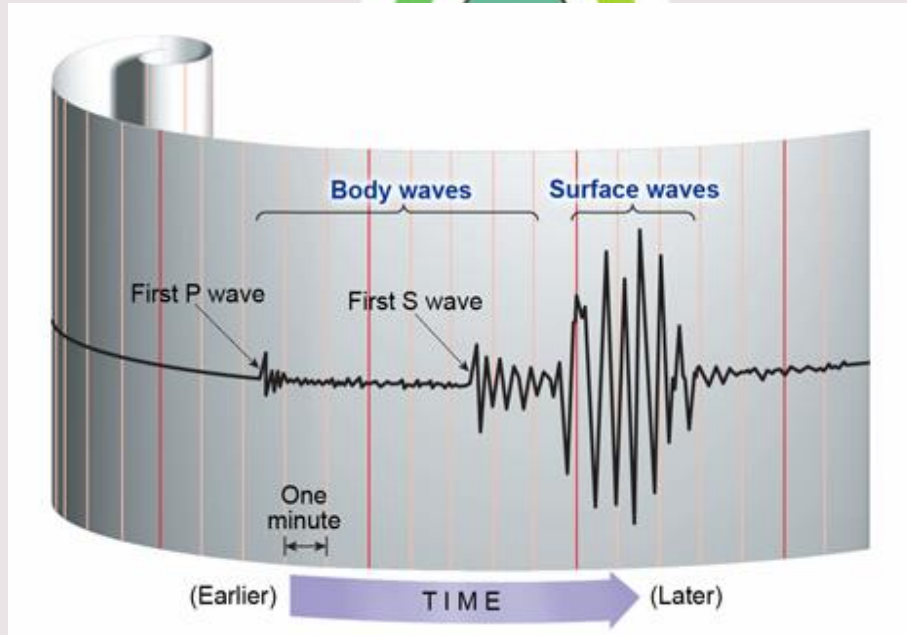




1994 Northridge Earthquake, Sylmar Hospital Free-field site



Seismic Hazard: EARTHQUAKES

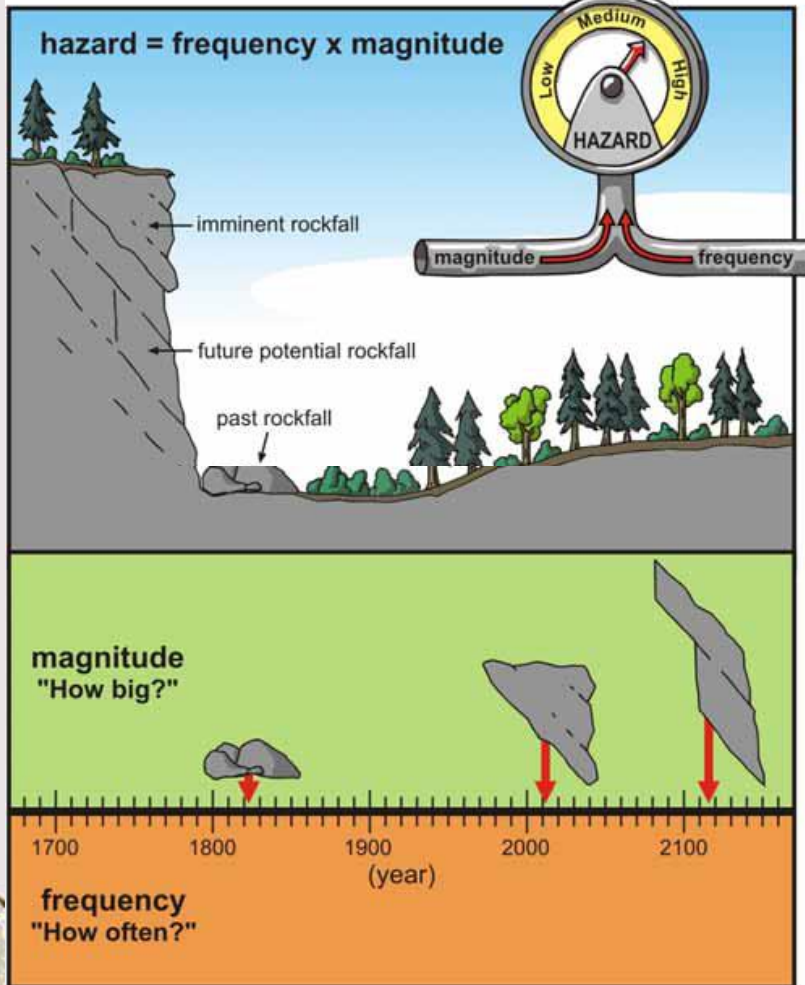


Seismic waves consist of P(compressive) and S(shear, distortional) waves.





Defining hazard



Seismic hazard

- Ground shaking
- Landslides
- Liquefaction
- Surface fault rupture
- Subsidence
- Tsunami
- Fire



Mitigation planning

Emergency response measures

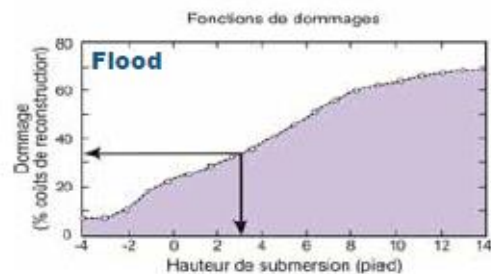
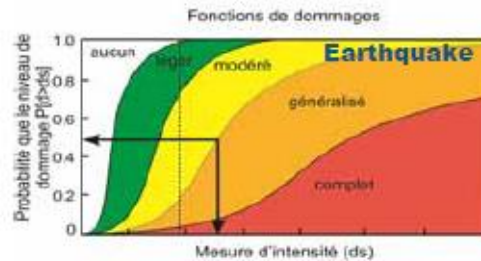
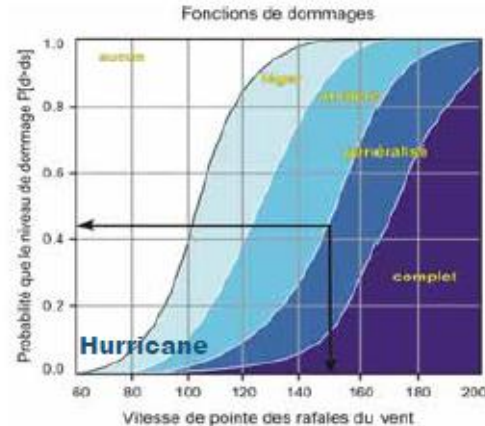
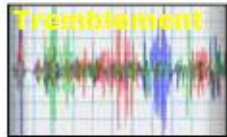


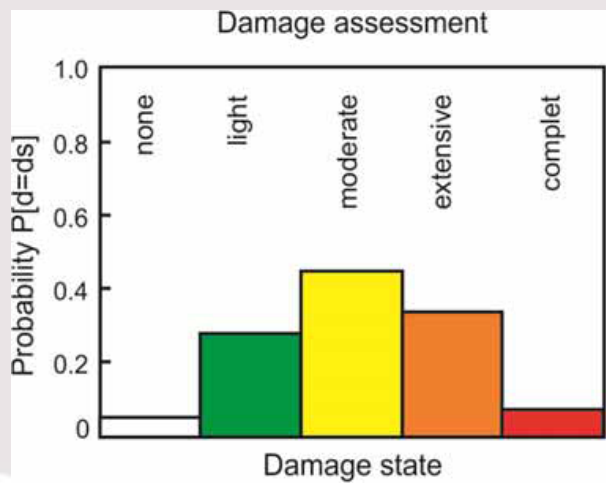
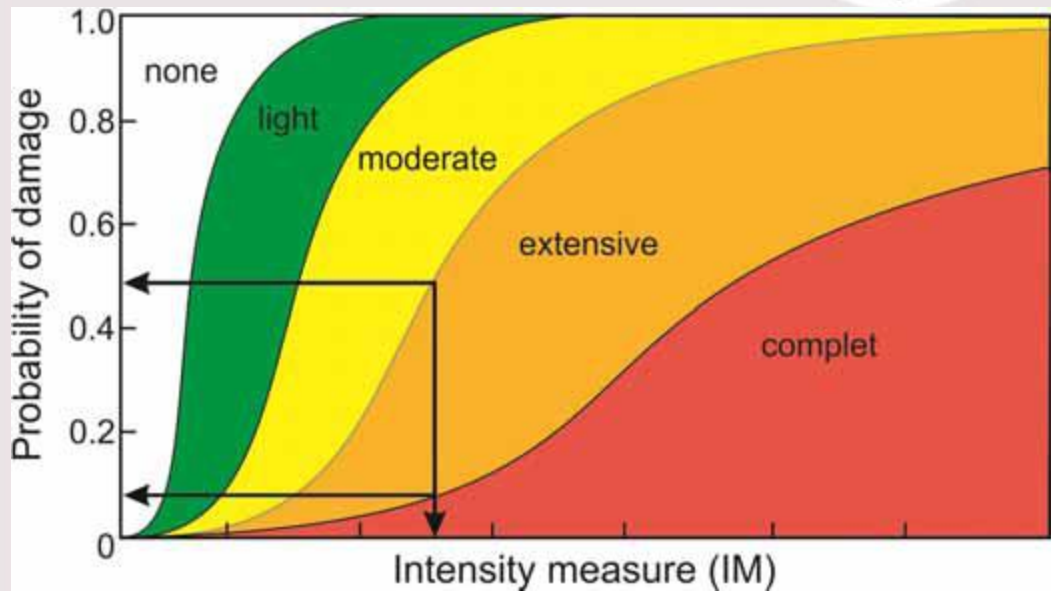
Co-funded by the
Erasmus+ Programme
of the European Union



The risk assessment process

Hazard x Exposure x Vulnerability → Consequences







Collaboration between academia and municipalities:

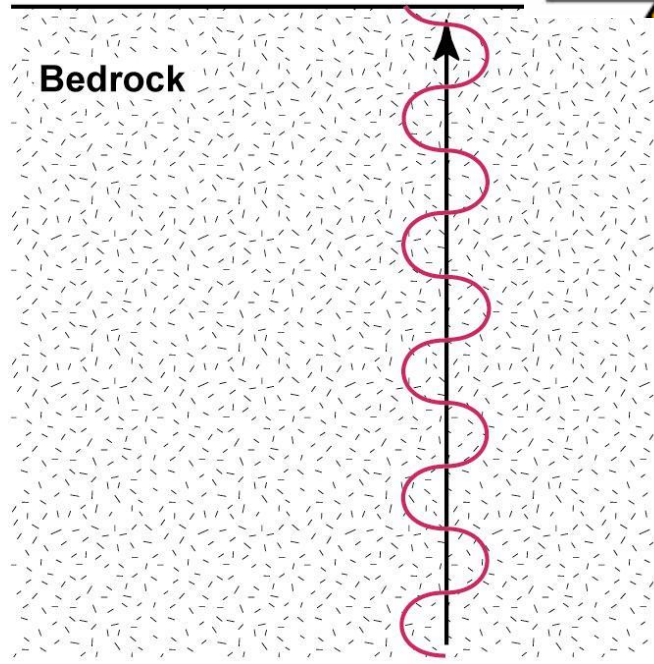
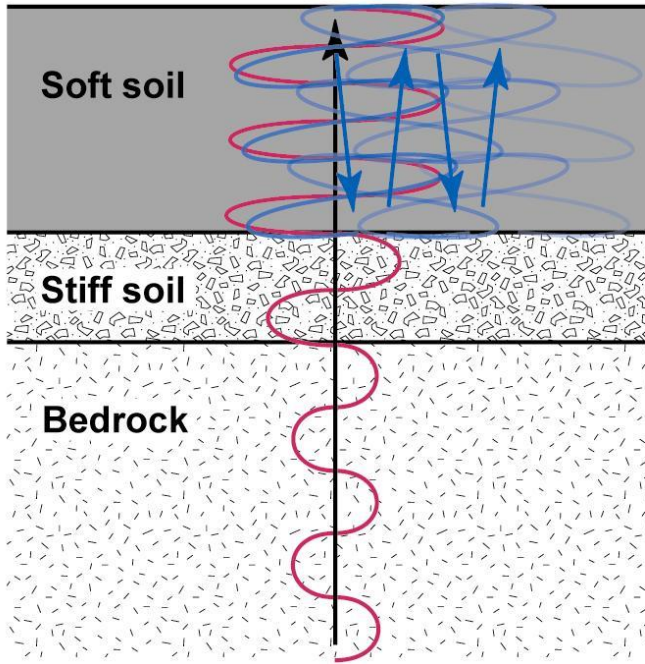
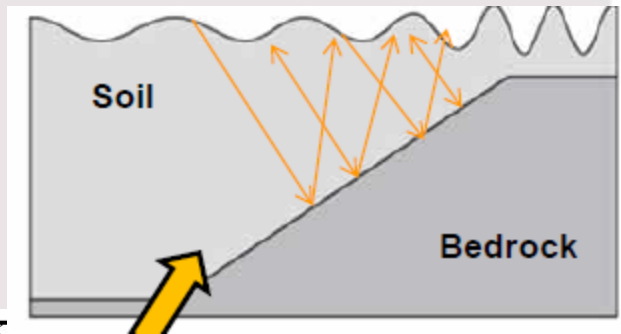
- Transfer already developed knowledge of user-friendly rapid risk-assessment tools
- Development of inventory for seismic risk-analysis
- Design a new practical and effective set of tools based on achieved experience



Co-funded by the
Erasmus+ Programme
of the European Union



Seismic hazard: site effects



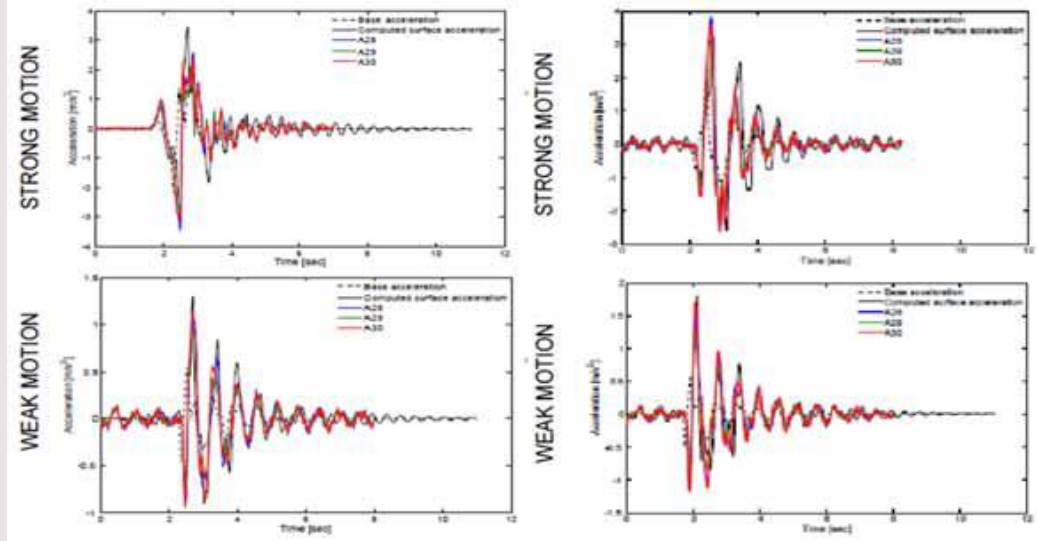
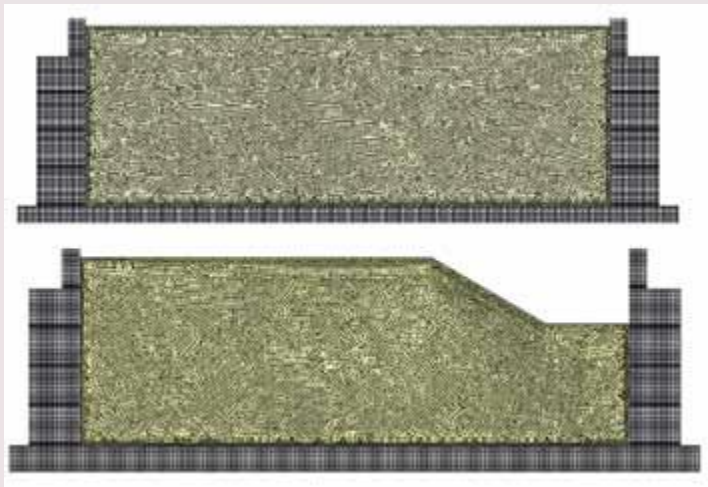
Seismic hazard: site effects



Lab experiments

Model validation: flat surface

30 degrees slope



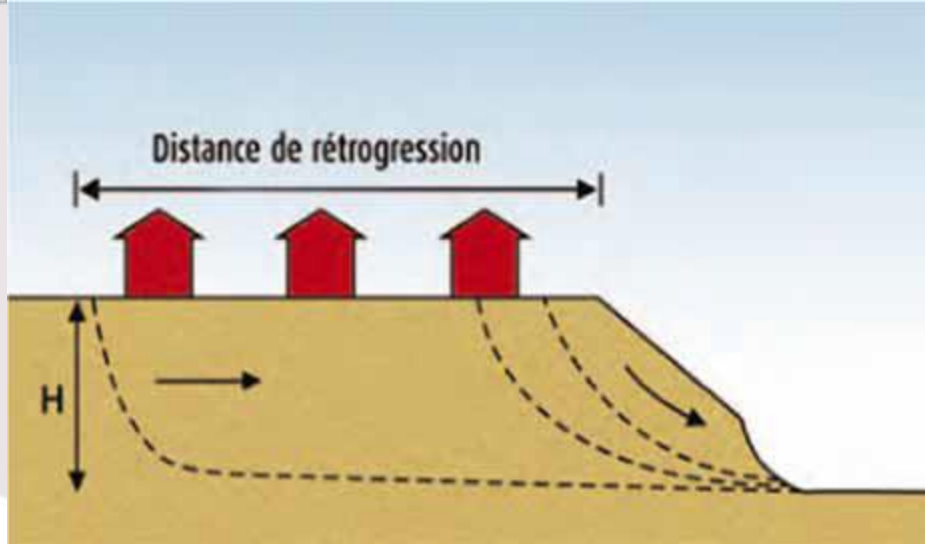
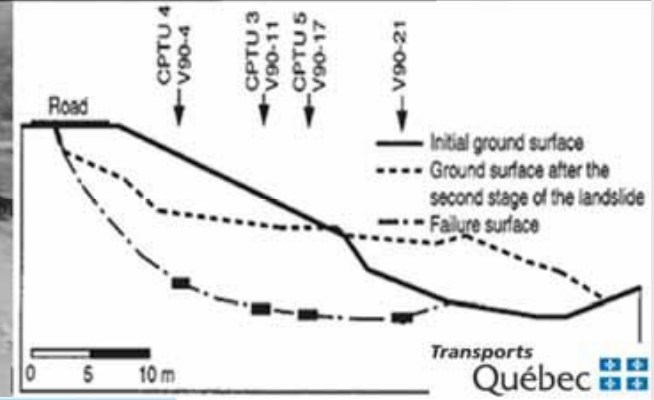
Topography (focalization of seismic waves)





Seismic hazard: Landslides

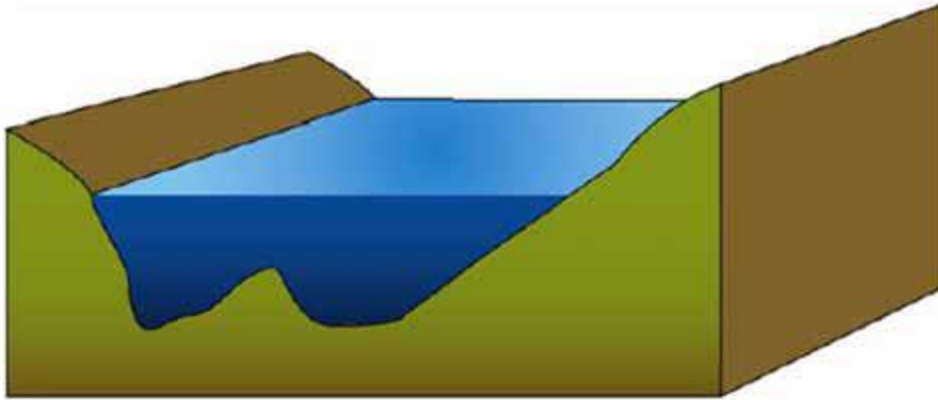
Landslides are the most widespread geological hazards



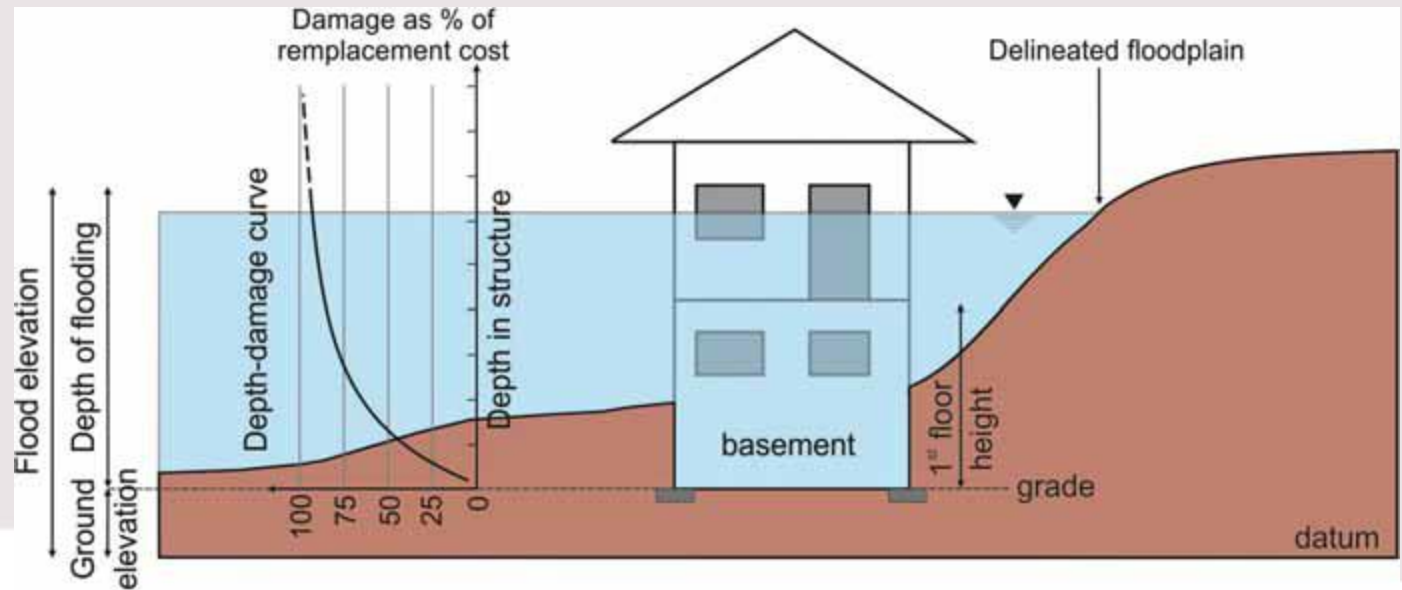
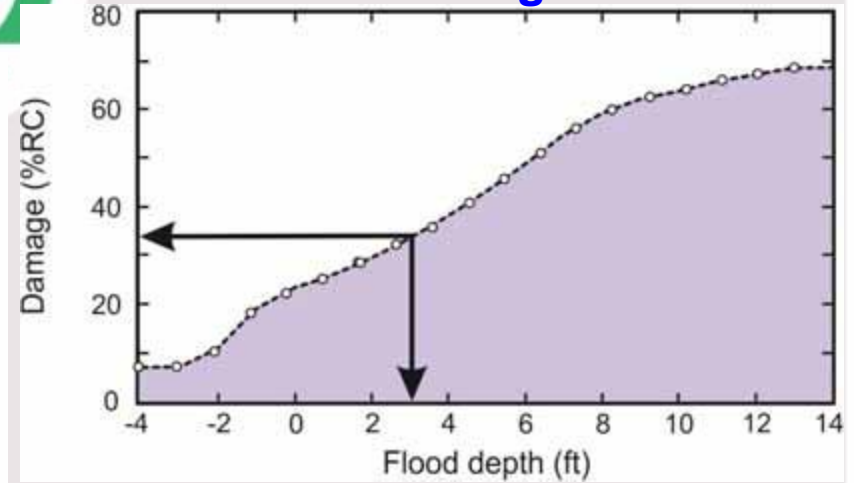
Co-funded by the Erasmus+ Programme of the European Union



Seismic hazard: Flooding



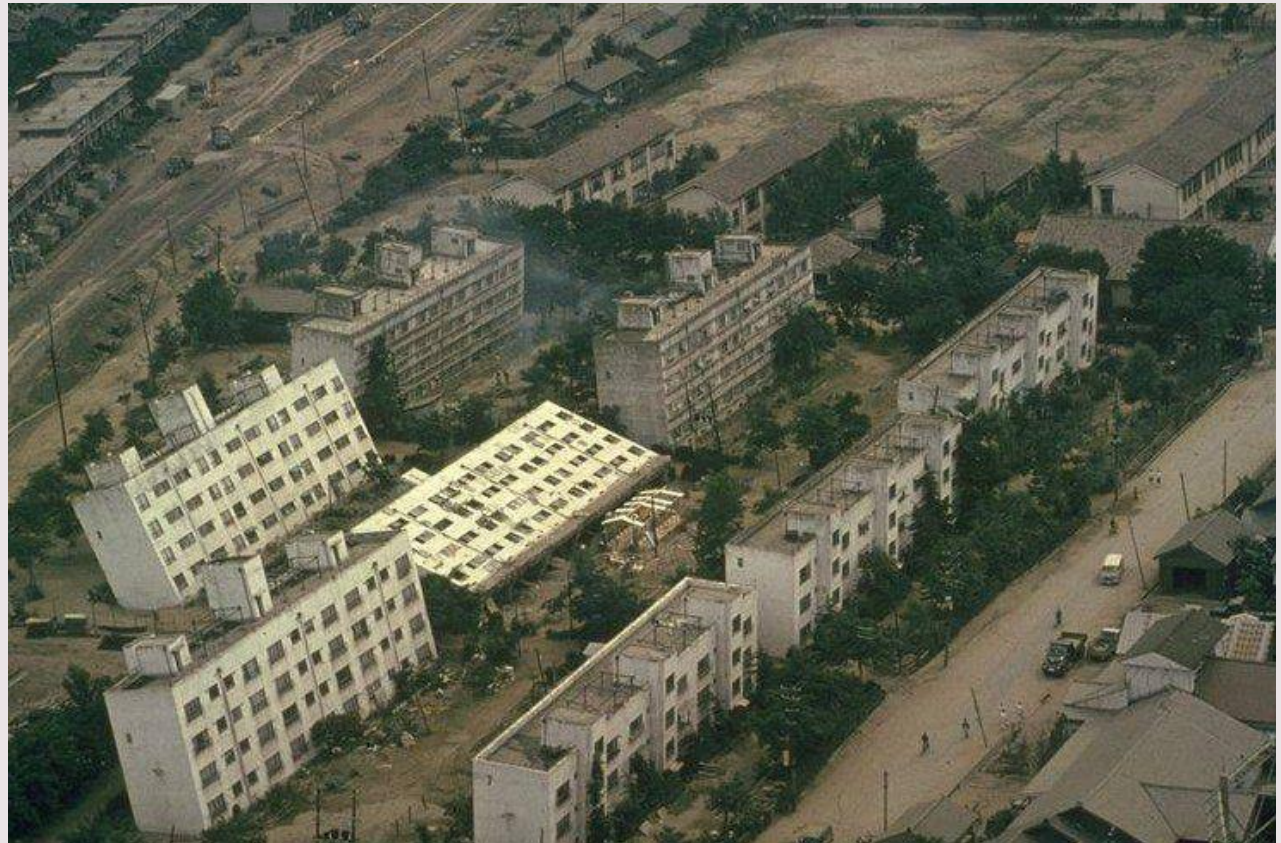
Flood damage function



Seismic hazard: Liquefaction



Overturnd apartment complex buildings





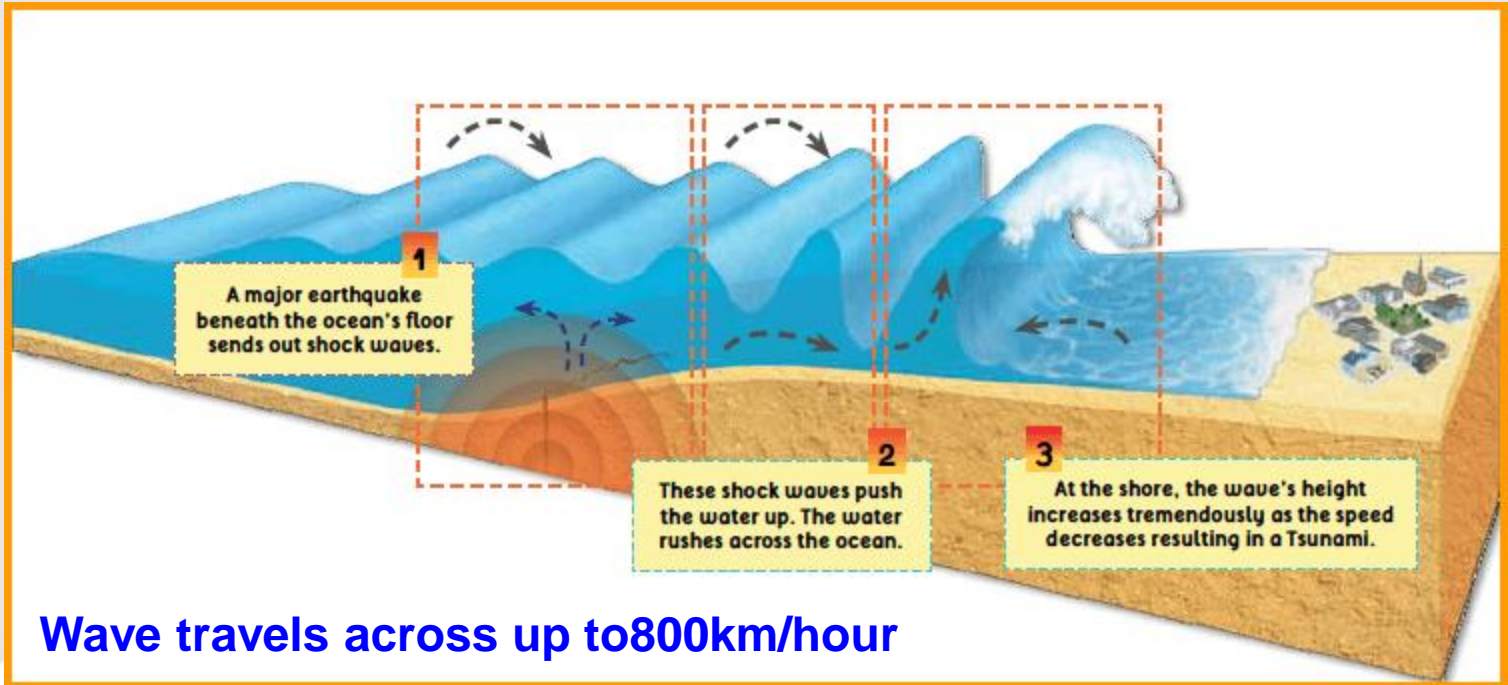
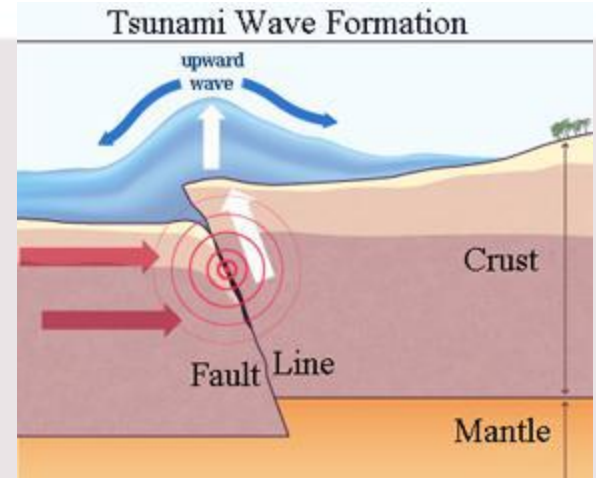
Seismic hazard: Surface fault rupture





Seismic hazard: Tsunami

Large Earthquake
at the oceanic bottom



Wave travels across up to 800km/hour





Protection and Rescue System - PRS

Law on Protection and Rescue

Law on Crisis Management

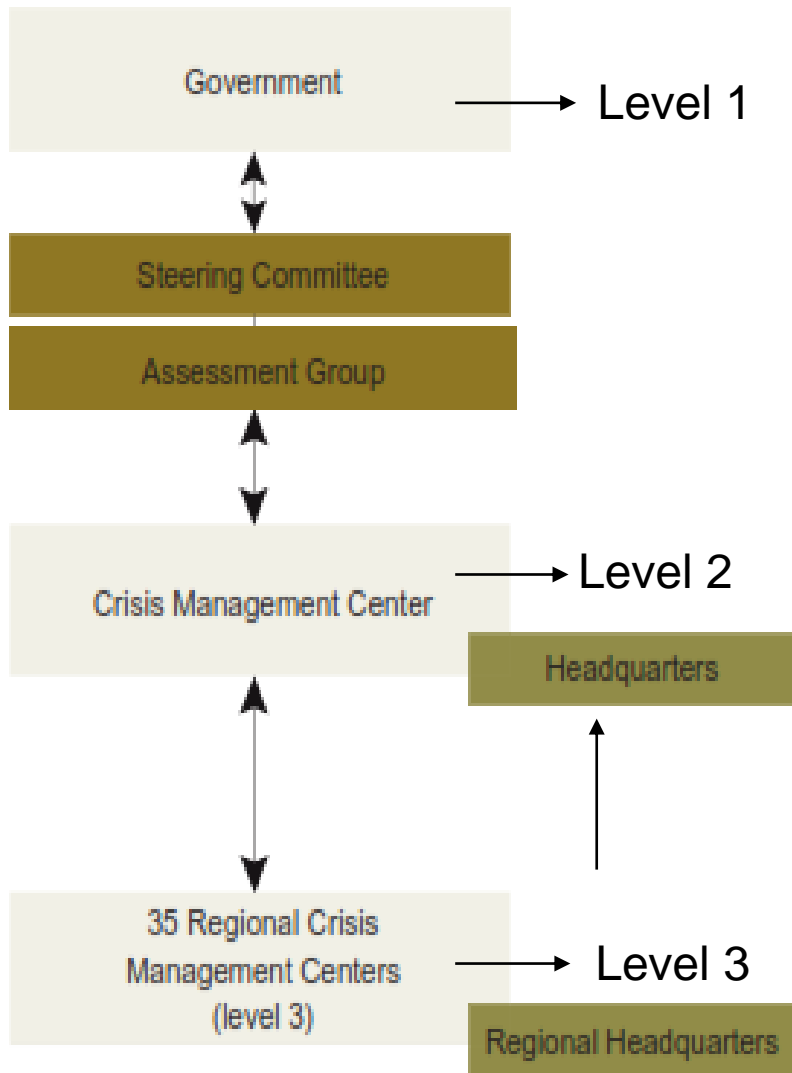


Co-funded by the
Erasmus+ Programme
of the European Union





ORGANIZATIONAL CHART



Level 1 :
Directorate for protection and rescue

Level 2:
Crisis management center composed by 8 Headquarters

- fire-fighting units,
- medical units,
- protection and animal rescue units,
- units to coordinate the evacuation and sheltering of people at risk.



FIRE FIGHTING BRIGADES



The Fire fighting brigades are managed by special local centres organised in every municipality.



Co-funded by the
Erasmus+ Programme
of the European Union



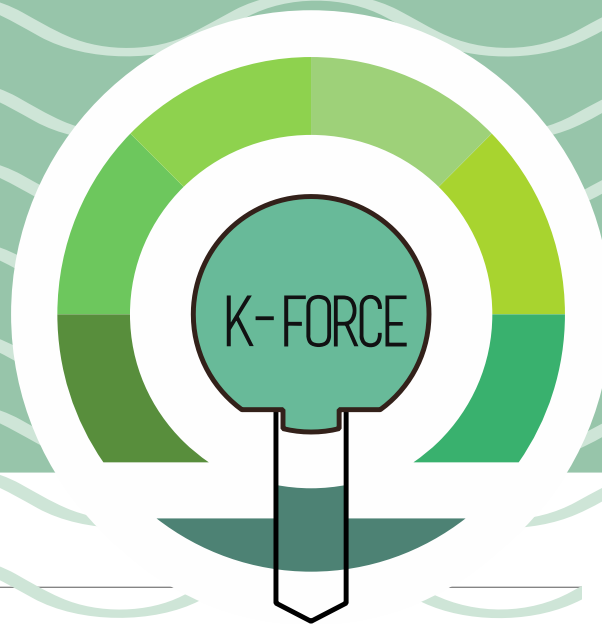


- **FIRE PROTECTION ELABORATE**
- **CHAMBER OF ARCHITECTS AND ENGINEERS**



Co-funded by the
Erasmus+ Programme
of the European Union





Co-funded by the
Erasmus+ Programme
of the European Union



Thank you
for your attention

*IZIIS – UKIM Skopje , Macedonia:
violeta@pluto.iziis.ukim.edu.mk*

Knowledge FOR Resilient soCiEty