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Graz - Austria

Refresher Training and Evaluation Workshop

Earthquake and Seismic Risk

Input for the small-scale exercise in Crete

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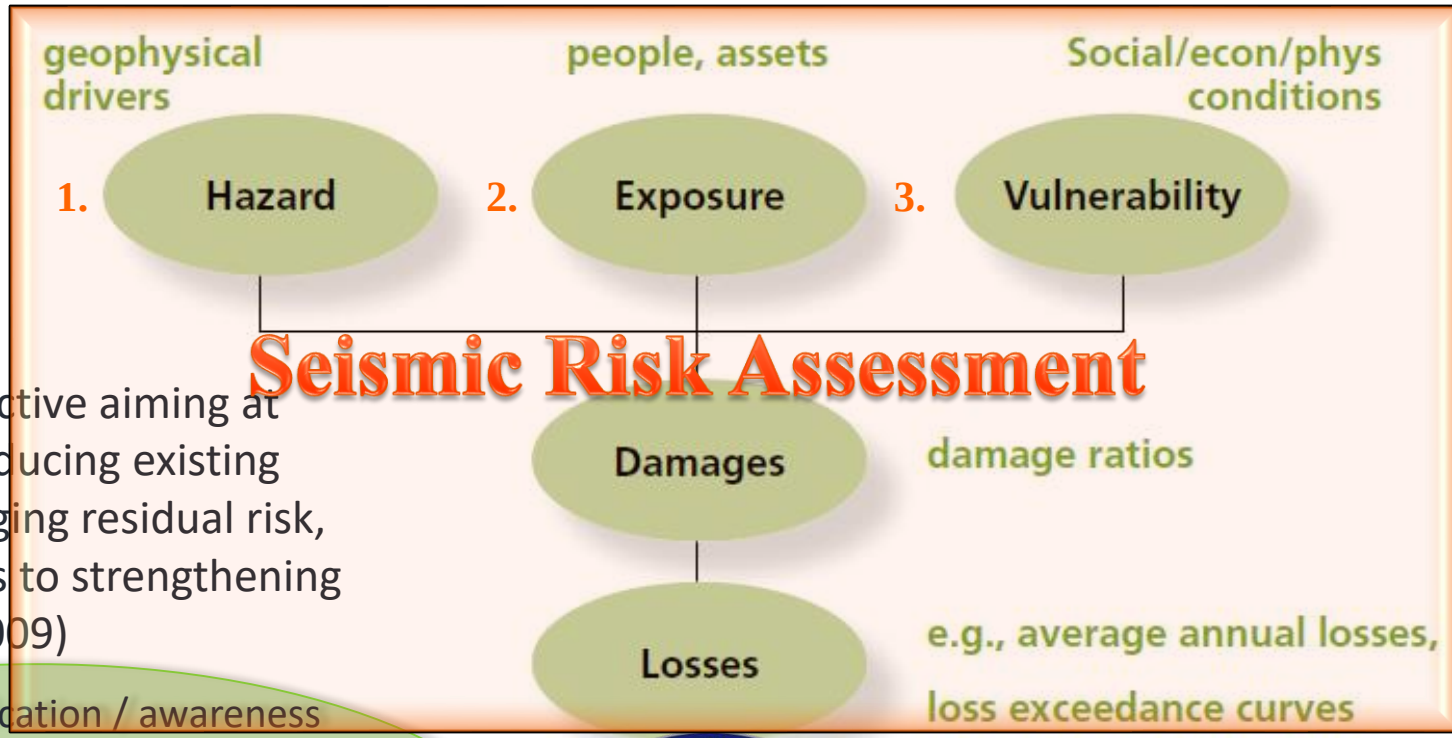
Earthquake Planning and Protection Organization (EPPO)

European Commission

Project co-funded by the EU Humanitarian Aid and Civil Protection

Seismic Disaster Risk Reduction (DRR)

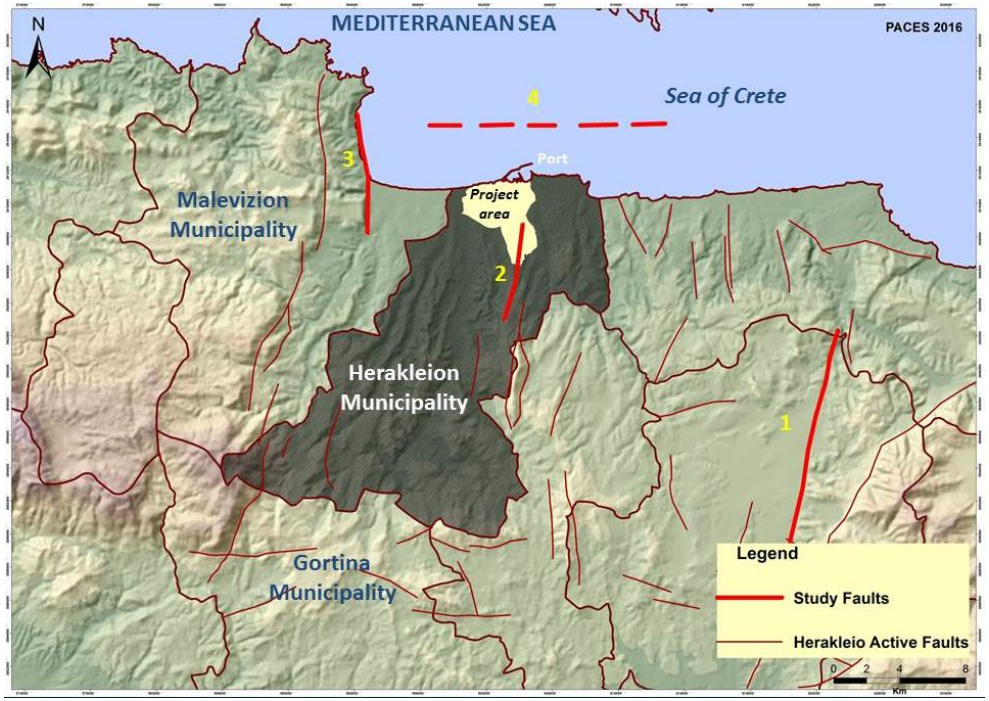


"**DRR** is the policy objective aiming at preventing new and reducing existing disaster risk and managing residual risk, all of which contributes to strengthening resilience" (UNIDSR, 2009)

- ✓ Risk identification / awareness
- ✓ Risk reduction (e.g. Building codes, prioritization of retrofitting investments, resilient reconstruction)
- ✓ Financial management and/or transfer of risk
- ✓ **Emergency & preparedness measures, contingency planning**

1. Seismic Hazard

Seismic Hazard refers to the likelihood and the intensity of a potentially destructive earthquake to occur.

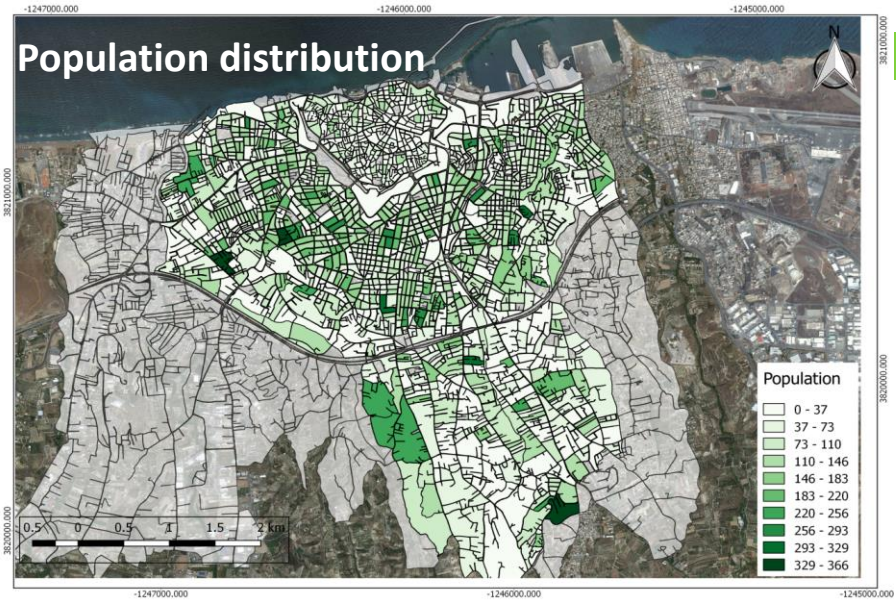


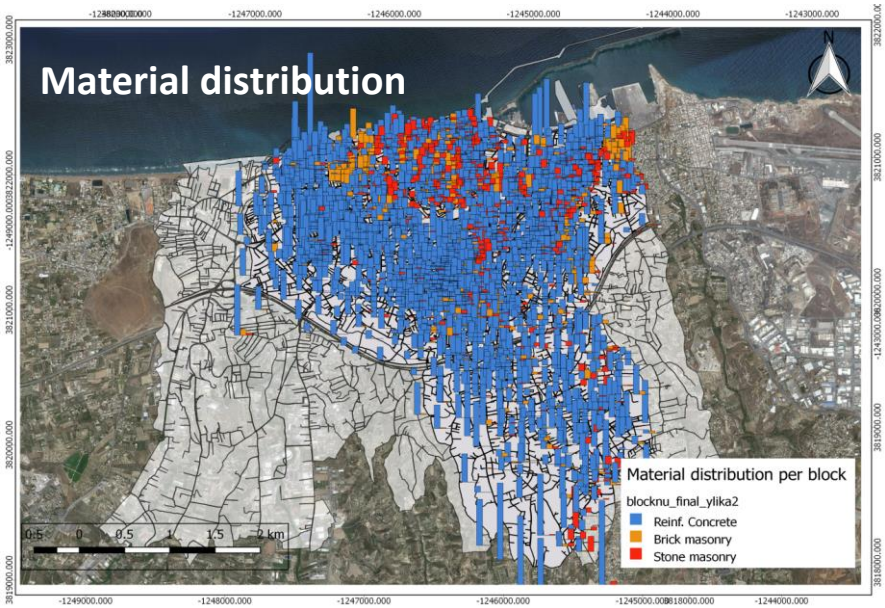
EARTHQUAKE

- Where?
- How big?
- How frequent?

2. Exposure

"**Exposure** refers to people, property, systems or other elements present in hazard zones that are thereby subject to potential losses when exposed to hazards" (UNIDSR, 2009)

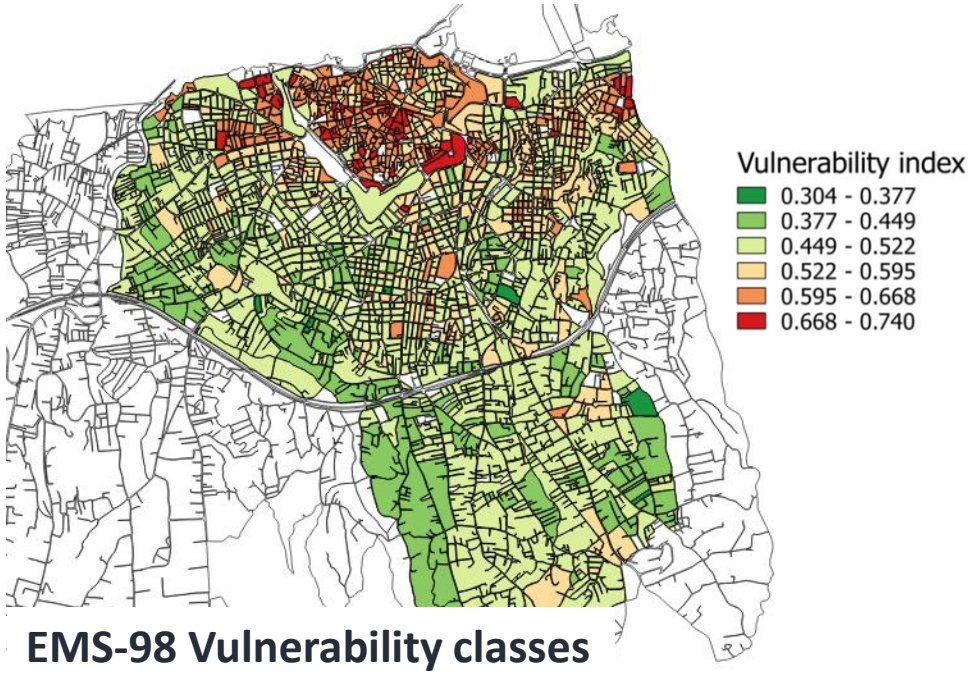




- Structural characteristics
- Occupancy type
- Building types
- Population
- Value
- Grouping into building typologies

3. Structural Vulnerability

Structural Vulnerability characterizes the expected endurance of the assets when exposed to the spatially variable forces produced by a hazard event.



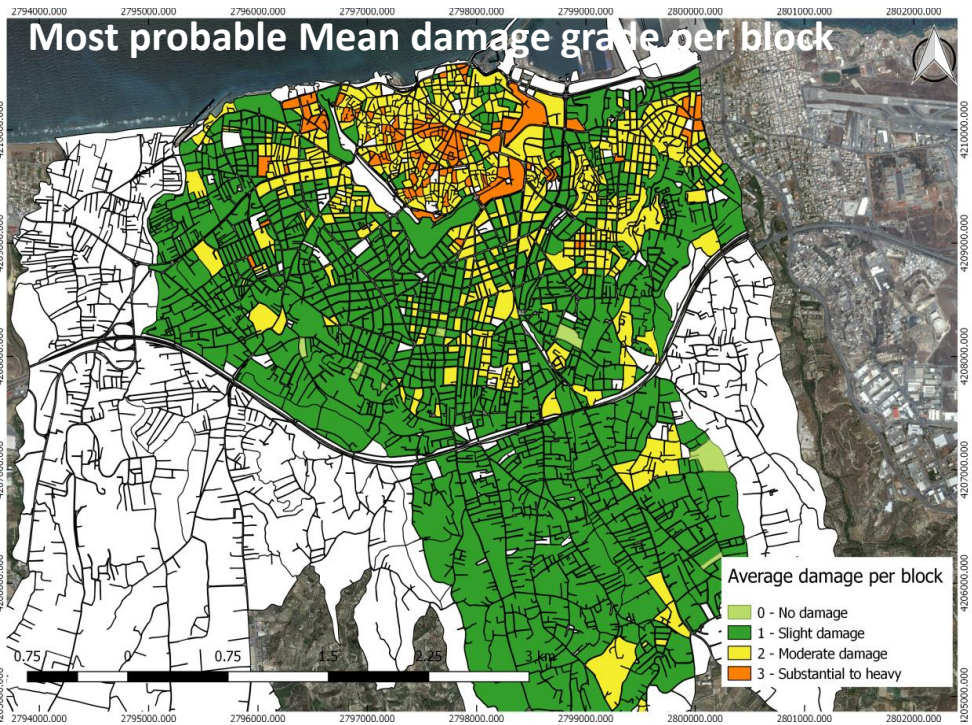
EMS-98 Vulnerability classes

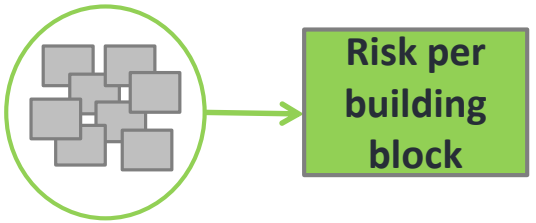
Depends on:

- Number of stories
- Design codes
- Material
- ER detailing & craftmanship
- Geometry & stiffness

Seismic Risk Result - Physical Damage

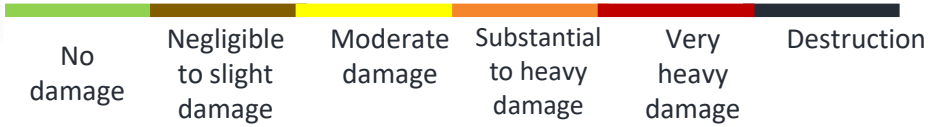
Seismic Risk = Building Stock * vulnerability * seismic hazard





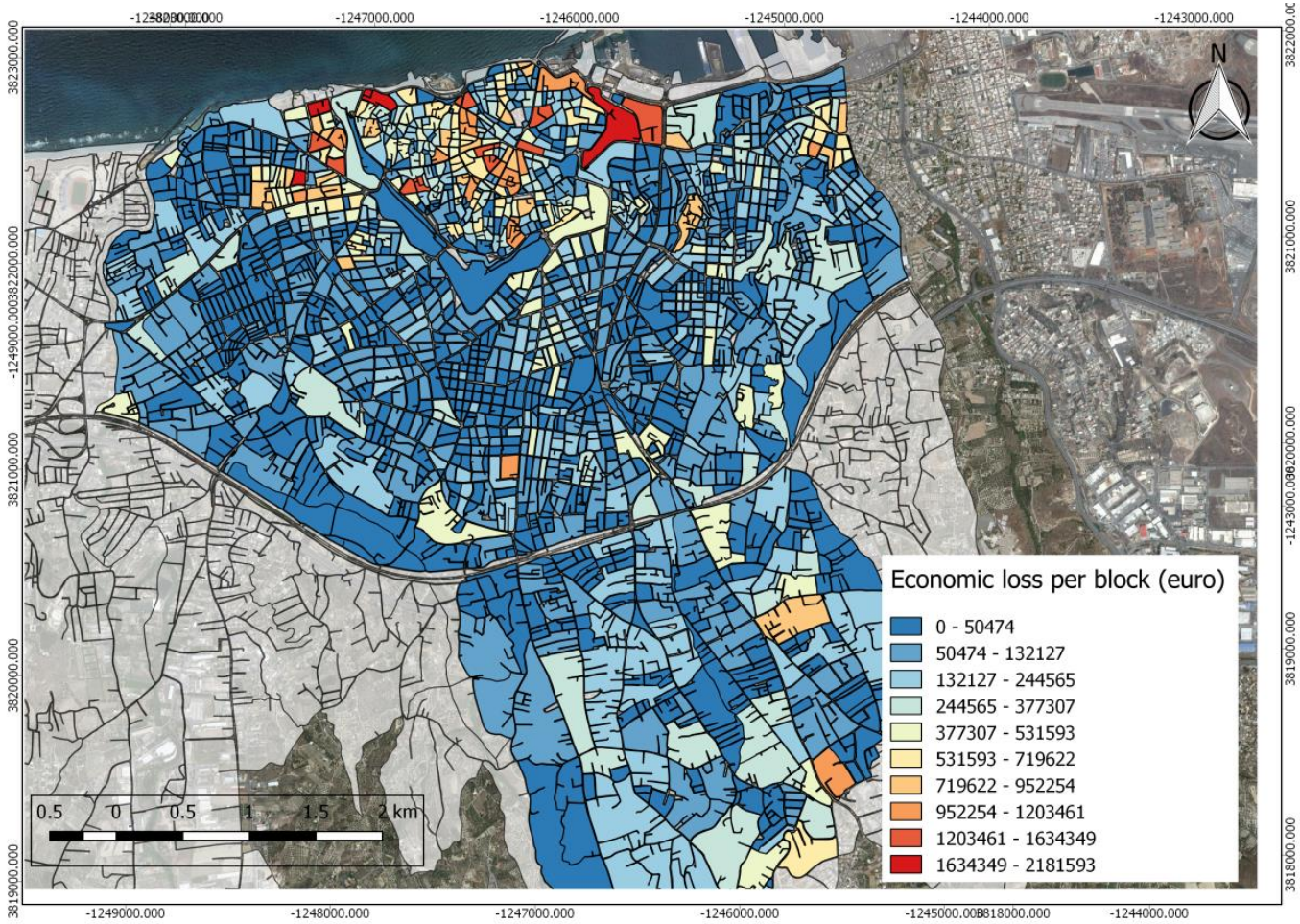
Classification of Damage

Grade 1 Grade 2 Grade 3 Grade 4 Grade 5



No damage | Negligible to slight damage | Moderate damage | Substantial to heavy damage | Very heavy damage | Destruction

Seismic Risk Result - Economic Loss

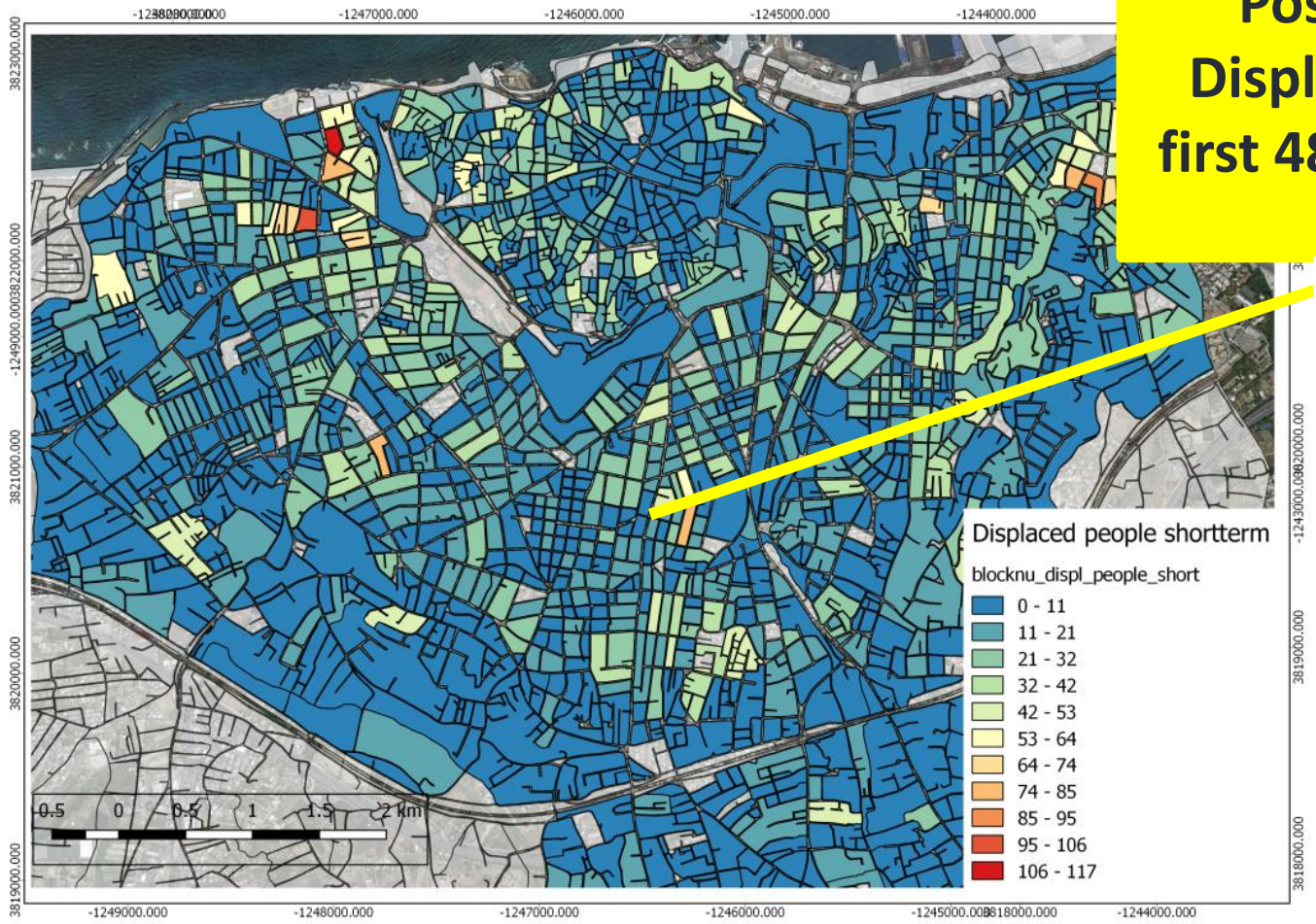


Economic Loss
~ 230 million euro

Assuming:

- Loss ratios per damage grade & typology
- Probability per damage grade
- Cost replacement new: 750€/m²

Seismic Risk Result – Emergency Shelter



Possible Number of Displaced People in the first 48 hours after the EQ ~ 10,000*

19,700 people from **DG 3+4+5**

- 50% to be housed, rest will "arrange by themselves"

9,850 people for emergency sheltering

Seismic Risk Result – Human Losses

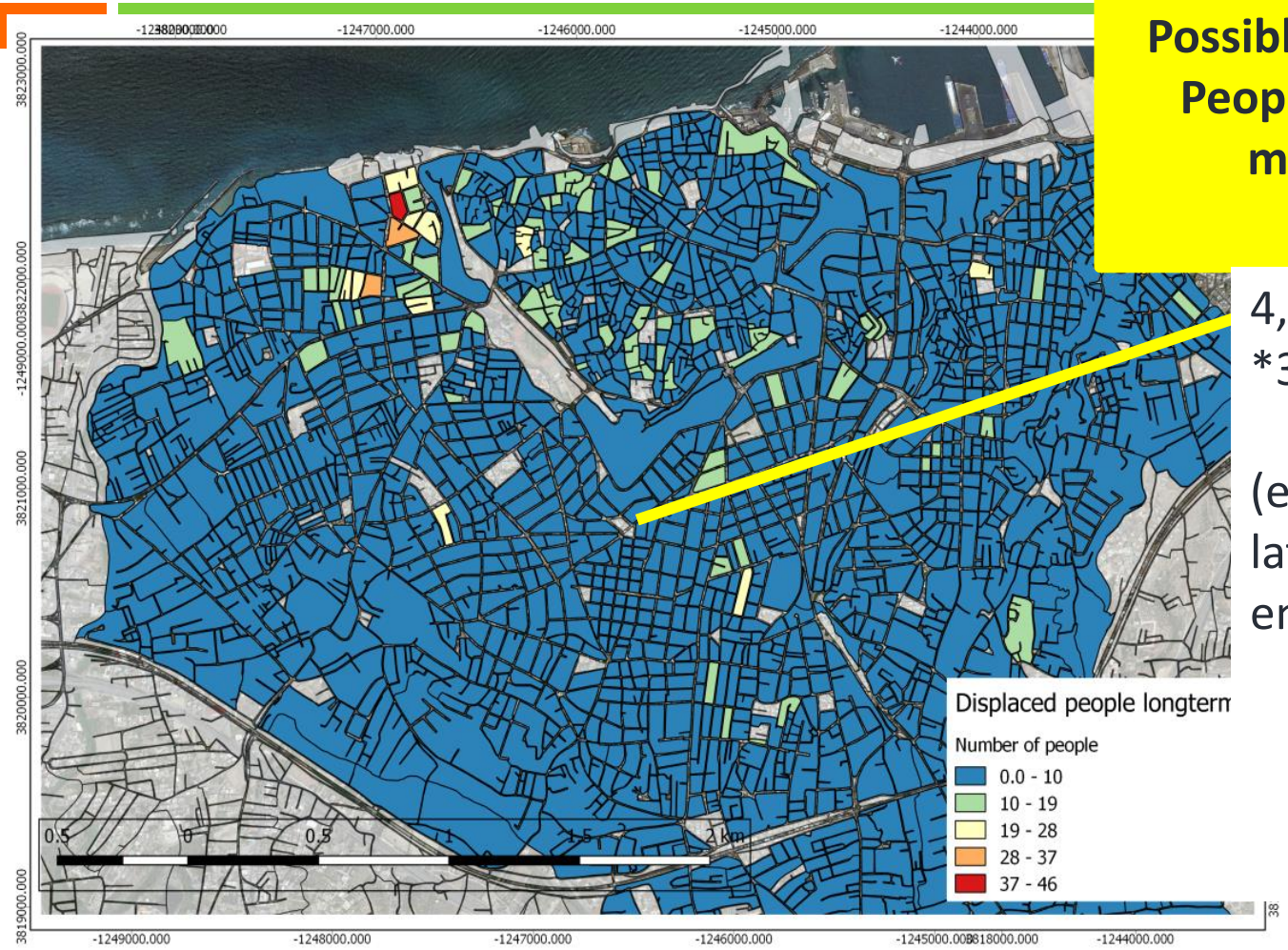
day scenario

- **Injured people:**
- **Severity 1** (injuries requiring basic medical aid): 337people
- **Severity 2/3** (injuries requiring a greater degree of medical care even posing life threatening condition): 90 people
- 32 **people dead**

night scenario

- **Injured people:**
- **Severity 1** (injuries requiring basic medical aid): 421 people
- **Severity 2/3** (injuries requiring a greater degree of medical care even posing life threatening condition): 113 people
- 40 **people dead**

Seismic Risk Result – Temporary Housing



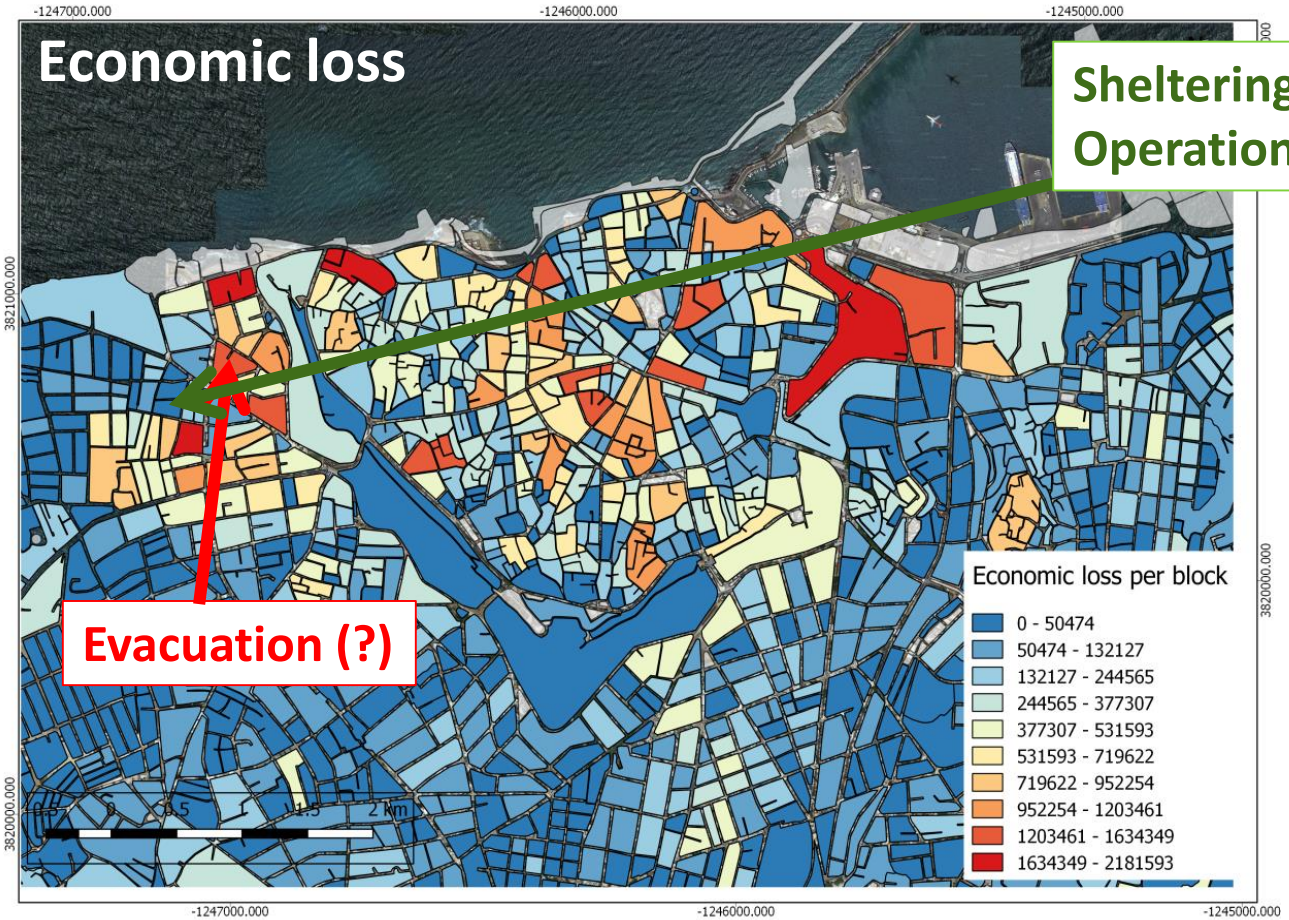
Possible Number of Displaced People in the period of 4-6 months after the EQ ~1,500 people

4,500 people from **DG 4+5**
*30% **temporary housing**

(e.g. in Emilia 2 months later, 28% remain at the emergency shelters-4,500)

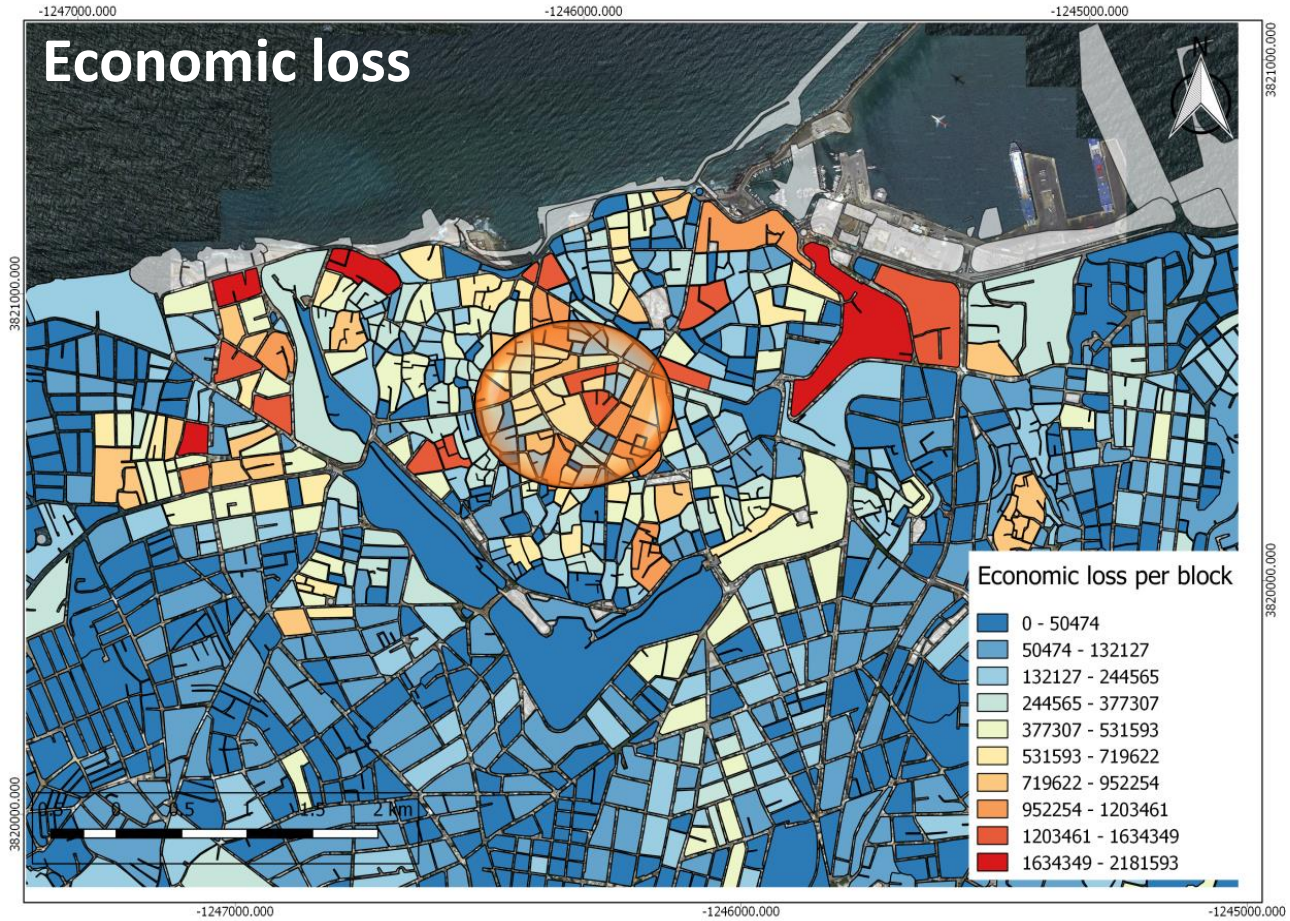
<u>1,350 people need temporary housing</u>

Seismic Risk Assessment as a tool for Emergency Management Planning



We use economic loss results as the most comprehensive result in quantitative terms

Seismic Risk Assessment as a tool for Emergency Management Planning



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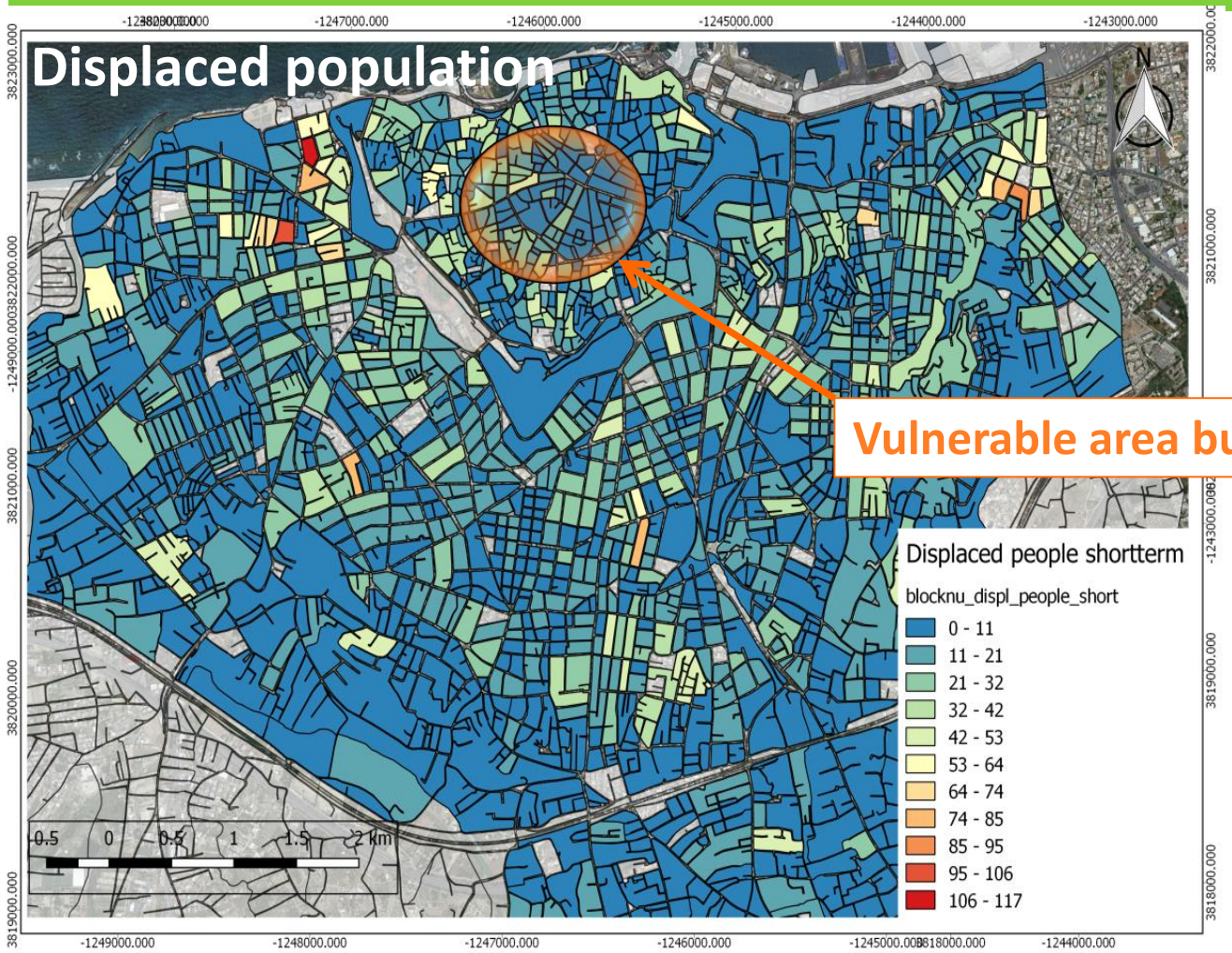
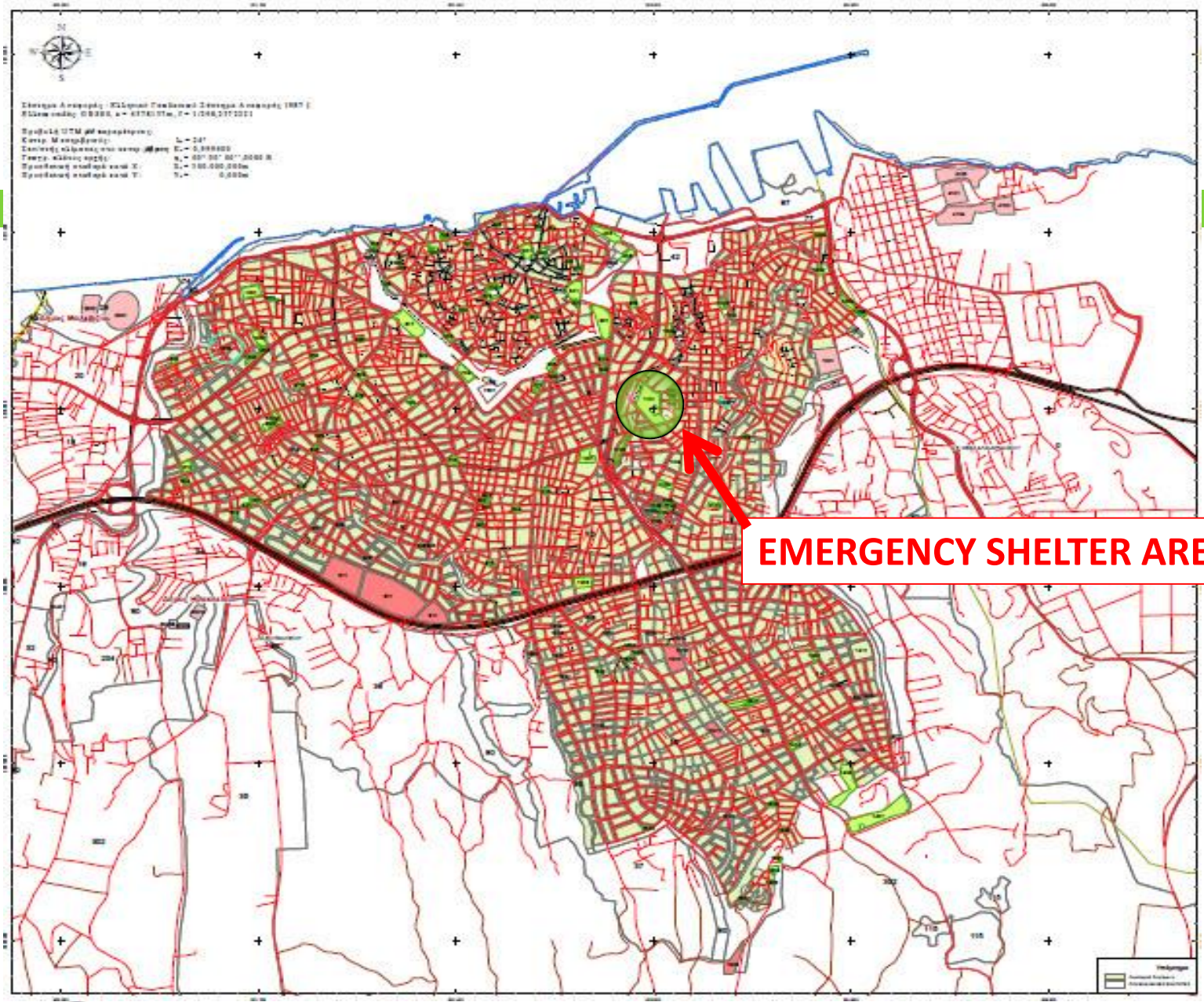
Seismic Risk Assessment as a tool for Emergency Management Planning

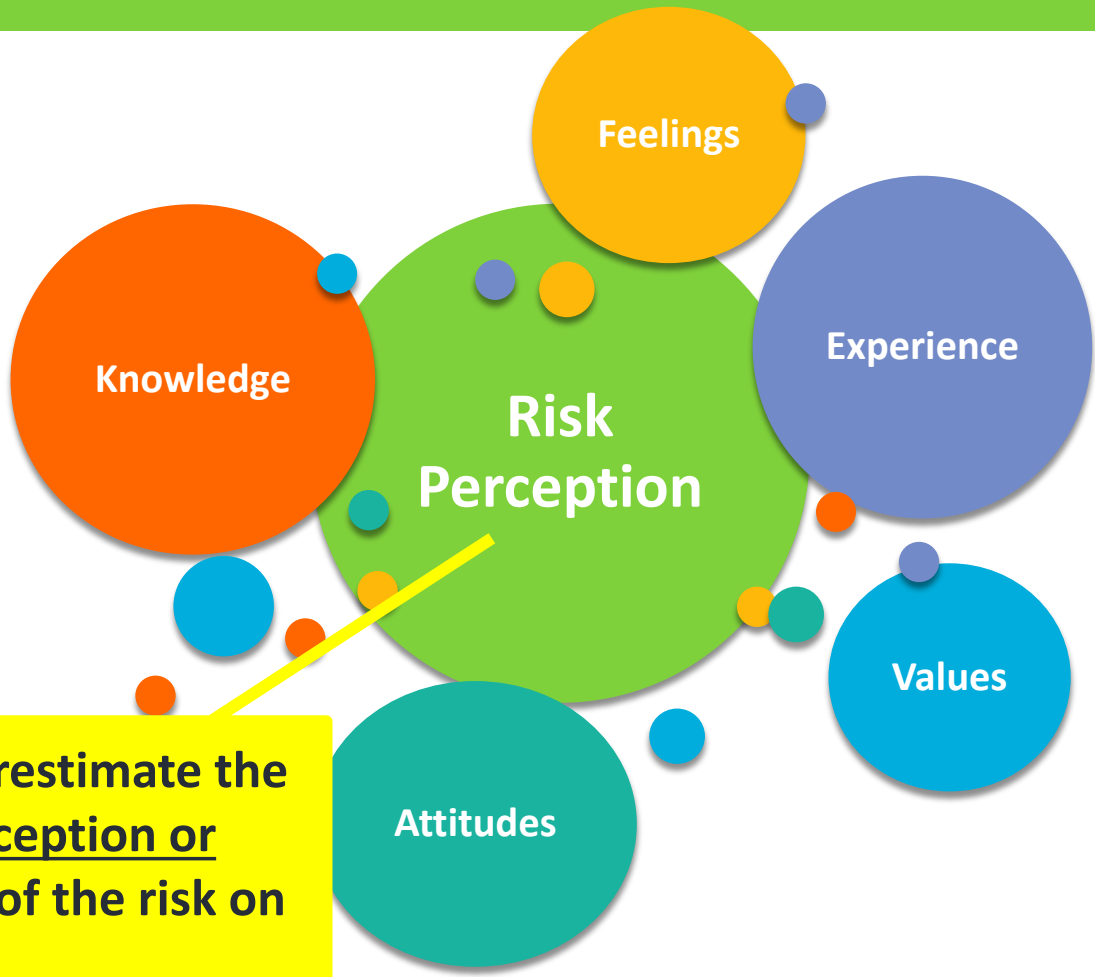



EMERGENCY SHELTER AREAS

Seismic Risk Communication Strategy

"THE PURPOSE OF (RISK) COMMUNICATION IS TO ASSIST PEOPLE TO OBTAIN THE INFORMATION THEY NEED TO MAKE INFORMED CHOICES ABOUT THE POSSIBLE RISK THEY FACE."

(Wade, C R, Molony, S T, Durbin, M E, Klein S H, and Wahl L E, (1992), P1)



People underestimate or overestimate the risk according to their perception or understanding of the impact of the risk on their own lives

Questionnaires

(Seismic Risk Perception-Seismic Risk Communication)

PROFESSION:

POSITION AT YOUR ORGANIZATION/ROLE:

COUNTRY:

EXPERIENCE OF SEISMIC DISASTER MANAGEMENT: ☐ YES / ☐ NO

SEISMIC RISK PERCEPTION

Please answer the following questions based on your professionalism for giving to PACES TEAM aspects of your Seismic Risk Perception. You may give more than one answer. Do not necessarily look for the correct answer but for the one that suits better your interests and understanding. (Please do not spend a lot of time, answer spontaneously)

1. Do you think Earthquake is a potential hazard at your area?
   - ☐ Yes
   - ☐ No
   - ☐ I don't know
2. Have you ever experienced an Earthquake with damages and losses?
   - ☐ Yes
   - ☐ No
3. Classify the hazard at which you are mostly exposed (indicate 1 for the highest to 6 for the lowest):
   - ☐ Earthquake
   - ☐ Flood Forest Fire
   - Terrorist attack
   - ☐ Accident
   - ☐ Disease
   - ☐ her_____
4. What does a Seismic Hazard Map indicate to you?
   - ☐ Earthquake prone areas
   - ☐ Active Faults

PACES: Preparedness for Appropriate accomodation in Emergency Shelters

SEISMIC RISK COMMUNICATION

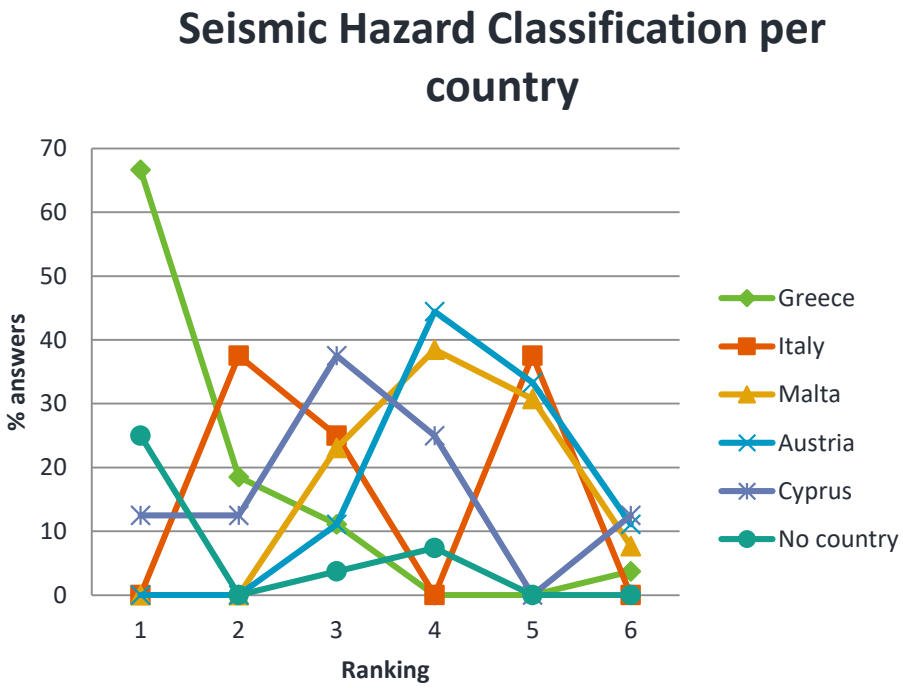
Please answer the following questions for giving to PACES TEAM your opinion of how does seismic risk communication can be improved. You may give more than one answer. (Please do not spend a lot of time, answer spontaneously)

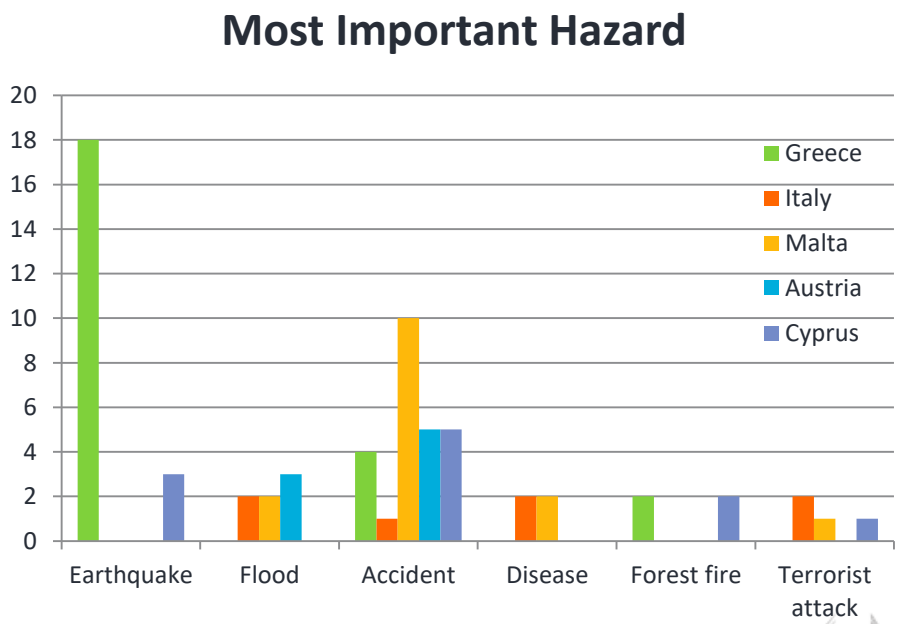
1. Seismic Risk Assessment has been already carried out for the area of your responsibility. How do you want to be informed about the results?
   - ☐ Through an organized press conference
   - ☐ Through a confidential meeting with the scientists/scientific committees
   - ☐ Through an open symposium
   - ☐ Through a meeting with the responsible civil protection authorities
   - ☐ Through a short PowerPoint presentation
   - ☐ Through a communication paper
2. How the Seismic Risk Assessment Results are most understandable to you?
   - ☐ If they have numbers (people affected, dead, injured people, etc)
   - ☐ If data, methodology and equations used are presented
   - ☐ If there are maps, satellite images, pictures
   - ☐ If compared with past events results

   Other_____
3. A strong Earthquake is happening at your area. What is the first information that you may look for?
   - ☐ Where is the epicentre?
   - ☐ What was the magnitude?
   - ☐ What is the acceleration?
   - ☐ What is the affected area?
   - ☐ Are there structural damages?
   - ☐ Are there casualties/injuries?

Your contribution is valuable…

Progress up to now…





Data used for the Heraklion Case study

- *Geographic Military Service*
  - *Topographic map – 1:50.000, DEM - Slope map, Hill shade*
- *Heraklion municipality*
  - *Microzonation study (1998) – scale 1:10000*
    - *Geological map of Heraklion city*
    - *Neotectonic map*
- *Hellenic Centre for Marine Research (HCMR)*
  - *Submarine fault map*
- *Hellenic Statistic al Authority (EL.STAT.)*
  - *Population data (Census 2011)*
- *EPANTIK 2009, Census 2001*
  - *Building stock data*
  - *Digital maps*
- *"ASPIDA PROJECT"*
  - *Fault map*

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Thank you very much!

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