



*Tower of David Museum,
Jerusalem, ,19-20 January 2014*

*Workshop - Seismic Risk Preparedness
and Mitigation of Archaeological and
Historical Sites*

Seismic Risk and Civil Protection in Italy

Prof. Mauro Dolce
Italian Department of Civil Protection



PROTEZIONE CIVILE
Presidenza del Consiglio dei Ministri
Dipartimento della Protezione Civile

- 1. Seismic risk vs. other risks in Italy**
- 2. The Cycle of Risk and the Italian Civil Protection System**



Impact by disasters in the world (1992-2012)

Impacts of Disasters since the 1992 Rio de Janeiro Earth Summit

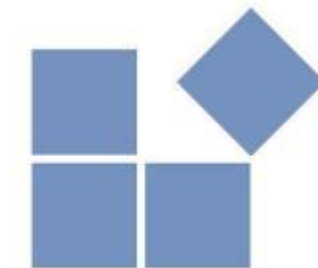
In 1992, the United Nations organized a conference on environment and development in Rio de Janeiro, called the Earth Summit. The purpose of the conference was to rethink economic growth, advance social equity and ensure environmental protection.

Twenty years later, the UN is organizing Rio+20, a chance to move away from business-as-usual and to end poverty, address environmental destruction and build a bridge to the future. Disaster risk



4.4
BILLION
AFFECTED

Equal to 64% of the world's population¹.



\$2.0
TRILLION
DAMAGE (USD)

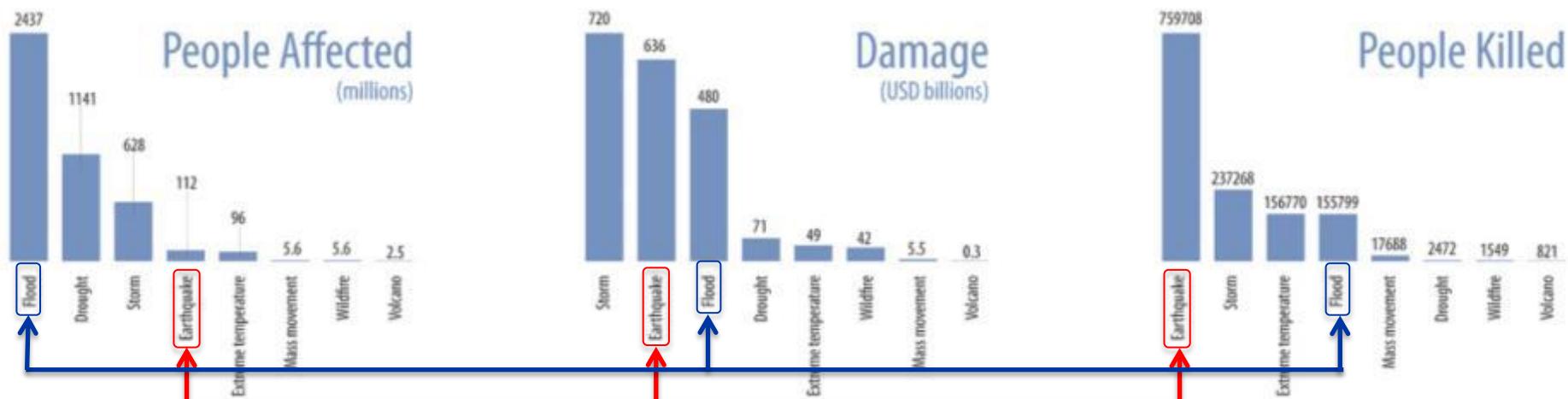
Similar to 25 years of total Overseas Development Aid¹.



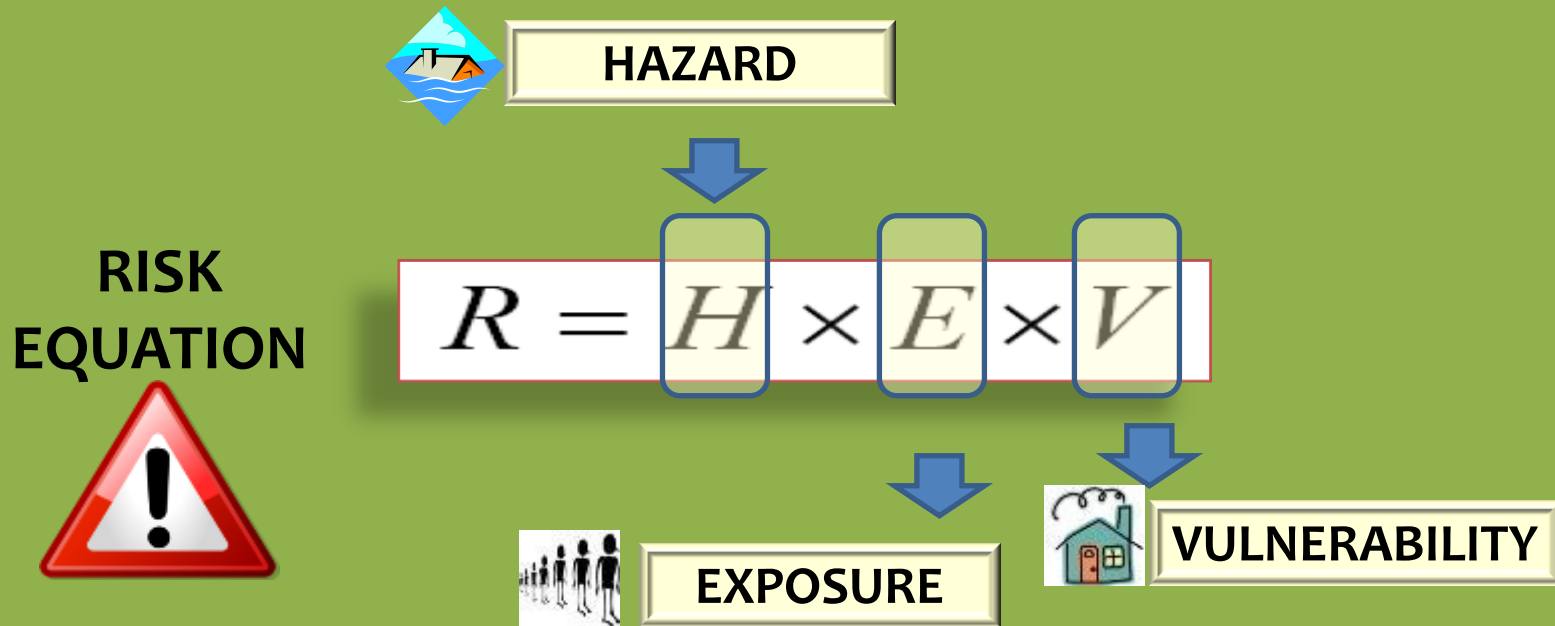
1.3
MILLION
KILLED

Comparable to 3125 jumbo jets¹.

Impact by disasters



The risk equation

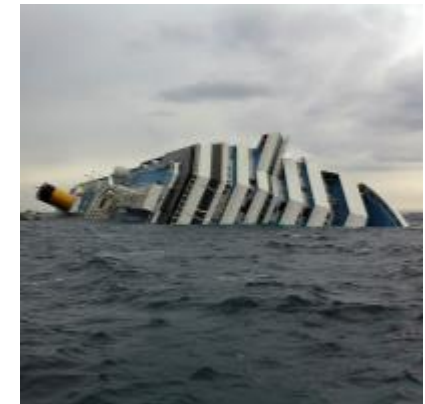


Seismic Risk

Estimate (probabilistic) of effects (human losses, injured, damage to properties and waste of economic activities) that earthquakes in a given area and a give time interval produce on exposed elements

Risks in Italy

- seismic
- hydrogeological
- floods
- volcanic
- forest fire
- industrial and nuclear
- technological
- transports
- supply networks
- environmental



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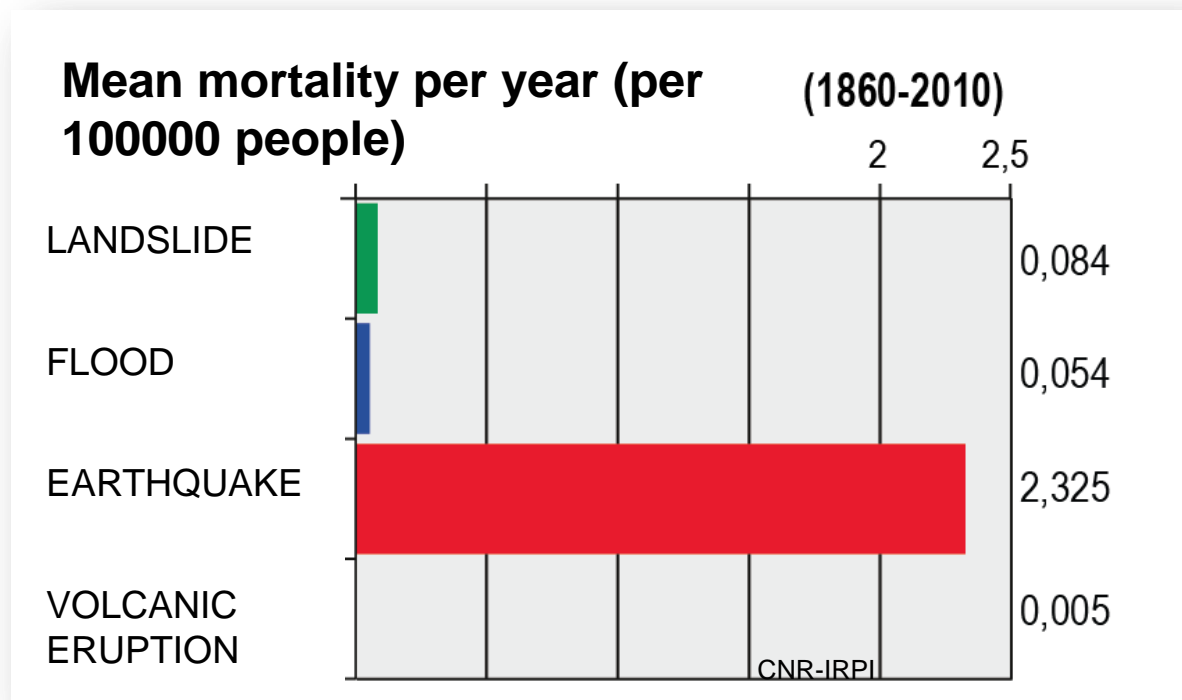
Risks in Italy

- seismic
- hydrogeological
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- supply networks
- environmental



Comparing natural risks in Italy

Due to its impact on large part of the national territory, earthquake is the most dangerous natural risk in Italy. In the past 150 years, the mortality related to earthquakes was 30 times higher than that related to landslides and floods.

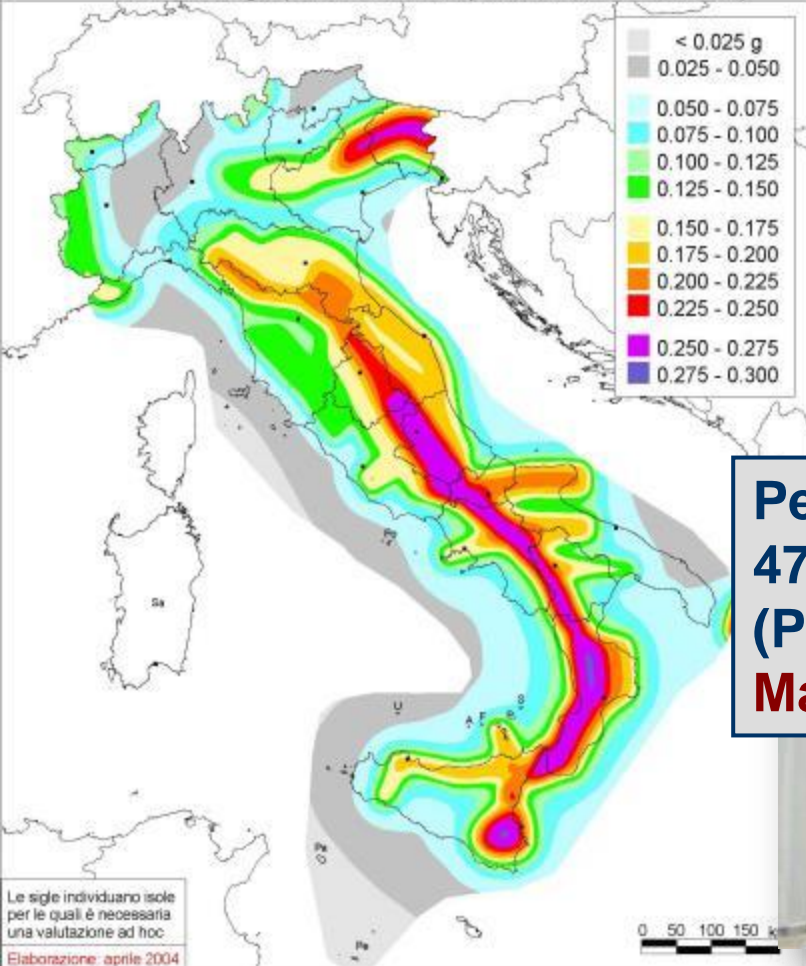


Seismic risk

 **ISTITUTO NAZIONALE DI GEOFISICA E VULCANOLOGIA**

Mappa di pericolosità sismica del territorio nazionale

(riferimento: Ordinanza PCM del 28 aprile 2006 n.3519, All.1b)
espressa in termini di accelerazione massima del suolo
con probabilità di eccedenza del 10% in 50 anni
riferita a suoli rigidi ($V_{s10} > 800$ m/s; cat. A, punto 3.2.1 del D.M. 14.09.2005)



L'AQUILA 2009

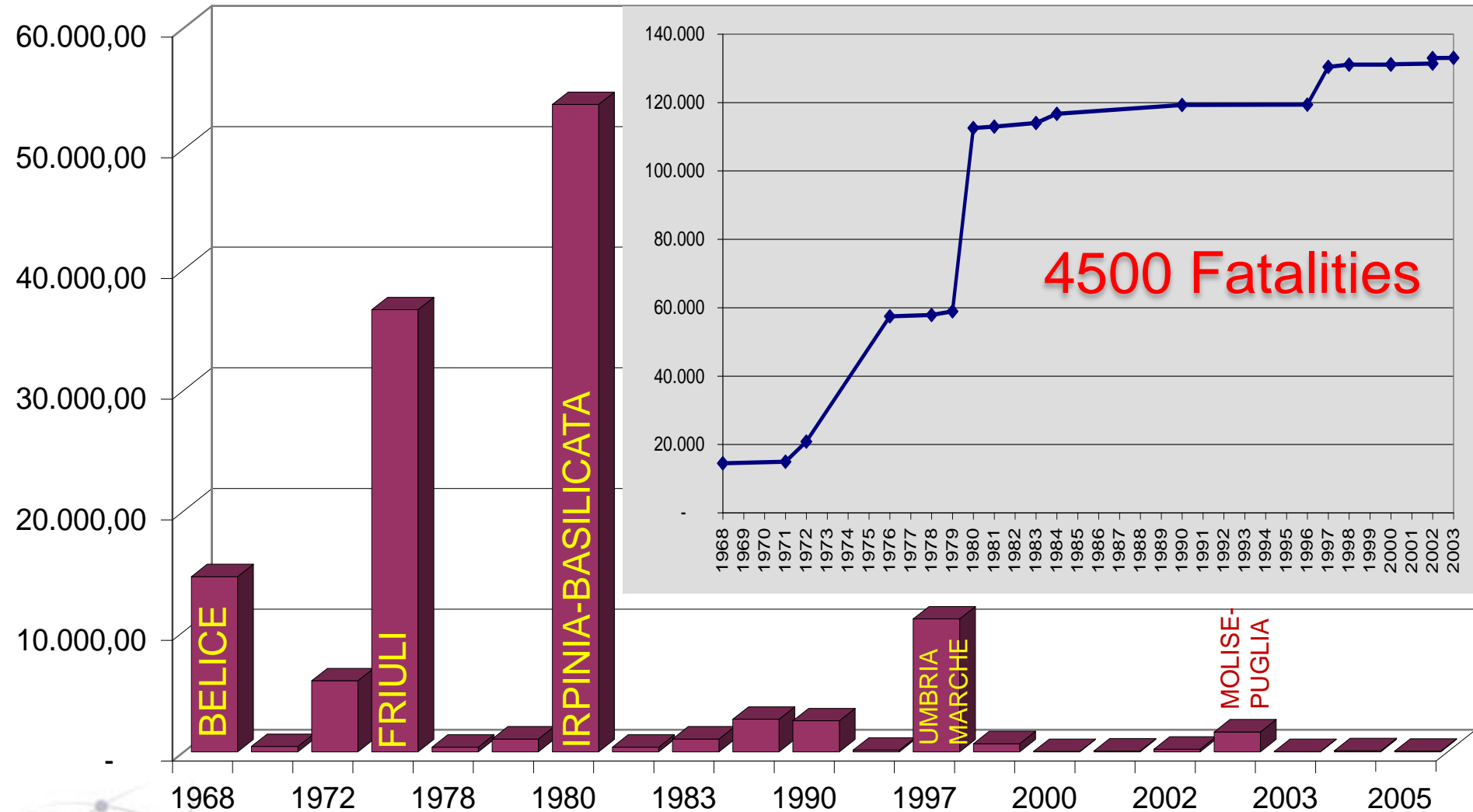


**Peak ground acceleration
475 years return period
(Prob. 10% in 50 yrs)
Max PGA = 0.28g**



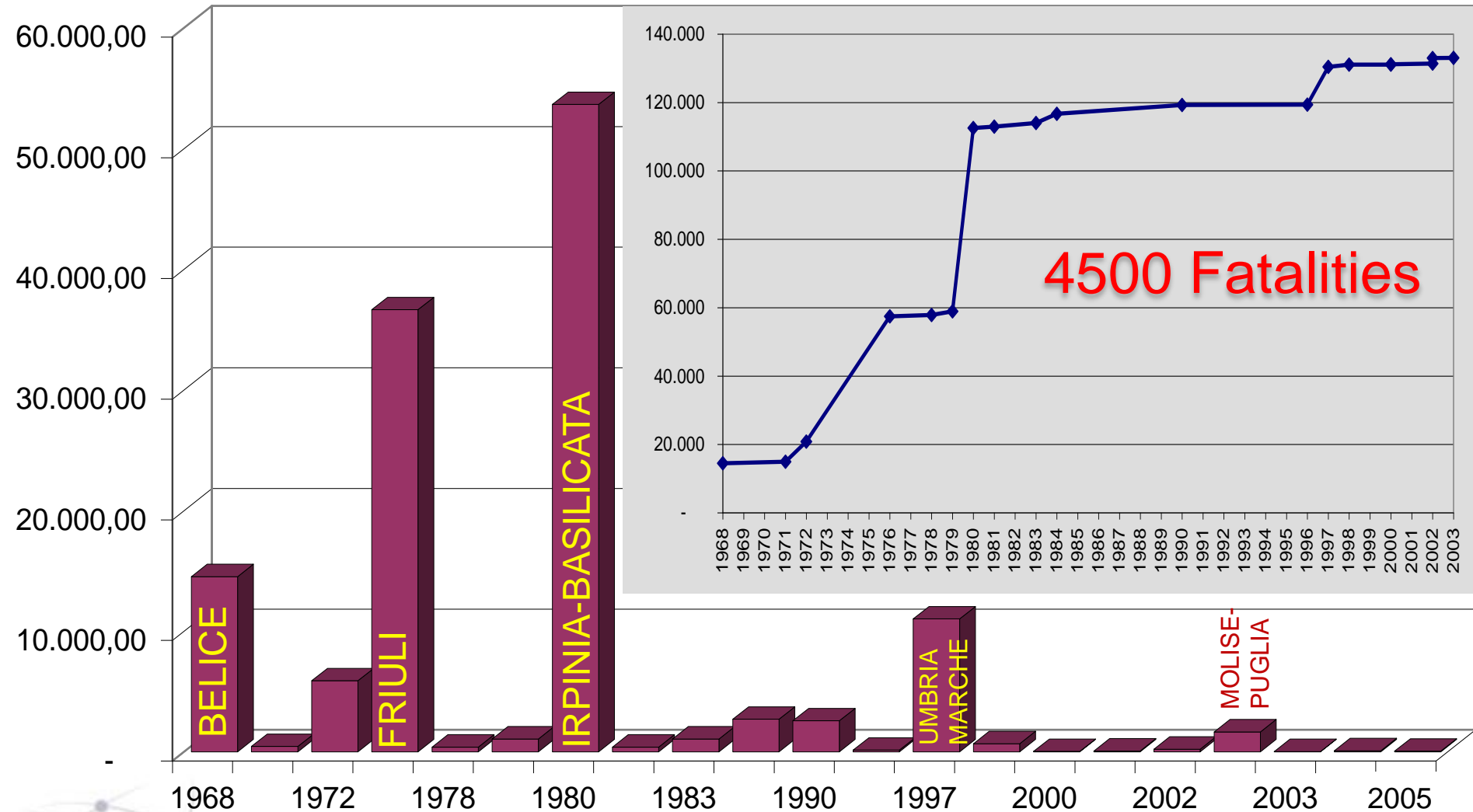
EMILIA 2012

Costs of Italian earthquakes past 50 years (m€-2005)



+ ABRUZZO '09 + EMILIA '12 (20-30.000?) ~ € 160 Bil.

Costs of Italian earthquakes past 50 years (m€-2005)



+ ABRUZZO '09 + EMILIA '12 (20-30.000?) ~ € 160 Bil.

Earthquake induced effects → Domino Effects

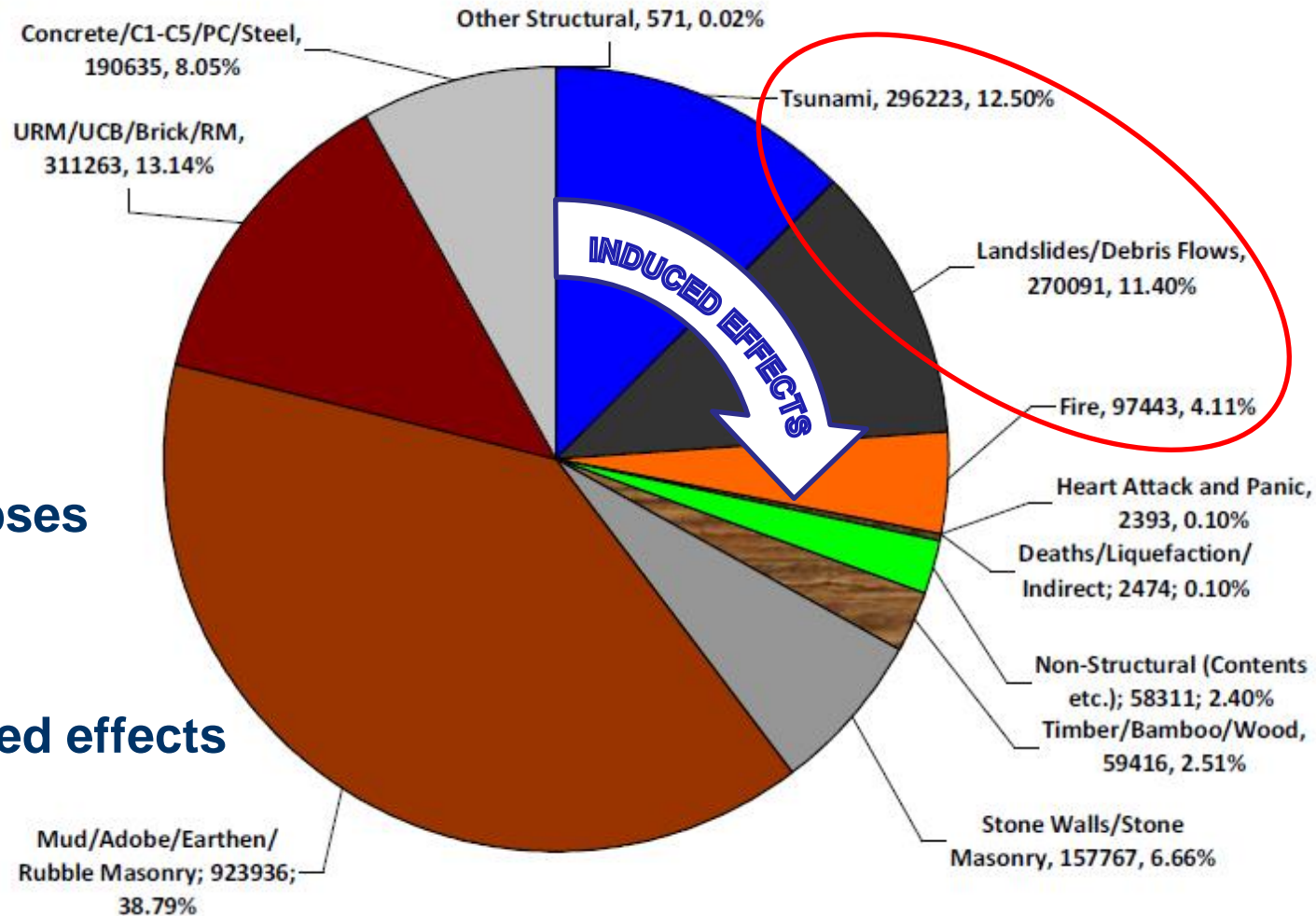
Messina earthquake - 1908

Earthquake-induced tsunamis



~90000 fatalities,
also due to the
tsunamis

Fatalities due to Earthquakes in the World (1900-2012)

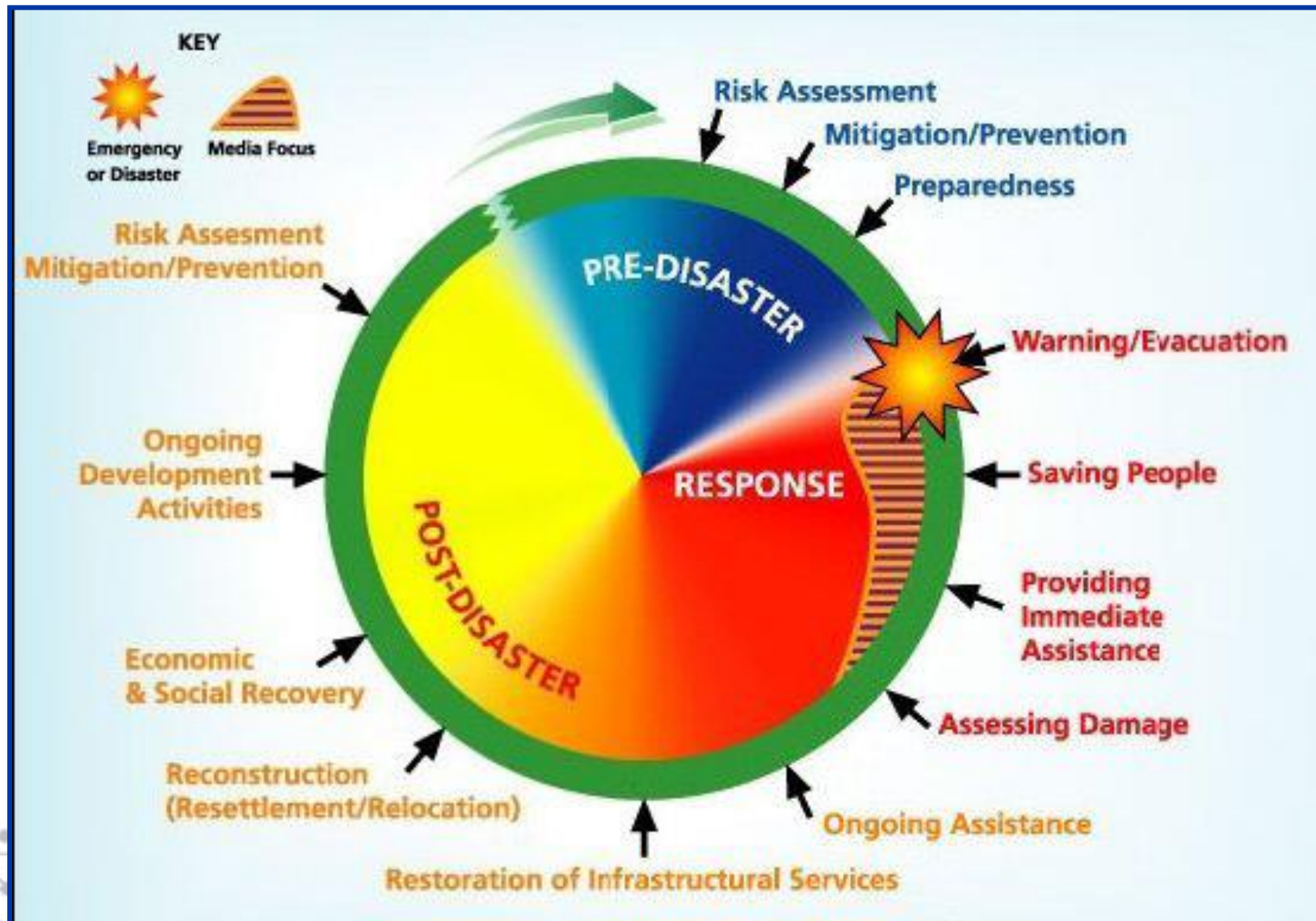


- **71% due to collapses**
 - 57% masonry
 - 8.5% concrete
 - 3.0% timber
- **29% due to induced effects**

1. Seismic risk vs. other risks in Italy
- 2. The Cycle of Risk and the Italian Civil Protection System**



Risk cycle





THE ITALIAN

NATIONAL SERVICE OF CIVIL PROTECTION

(Law n. 225 / 1992)

By “Civil Protection” it is meant
The ensemble of the activities put in place to protect
life, goods, settlements and environments
from damage and risk of damage due to calamities

In Italy «Civil Protection»
IS NOT a task assigned to a **SINGLE ADMINISTRATION**
BUT a function played by a **COMPLEX SYSTEM**



“NATIONAL SERVICE OF CIVIL PROTECTION”
(SNPC)

Established by the Law n. 225 of 1992
and coordinated by the (National) **Department of Civil Protection**
of the Prime Minister Office

THE ITALIAN CIVIL PROTECTION SYSTEM

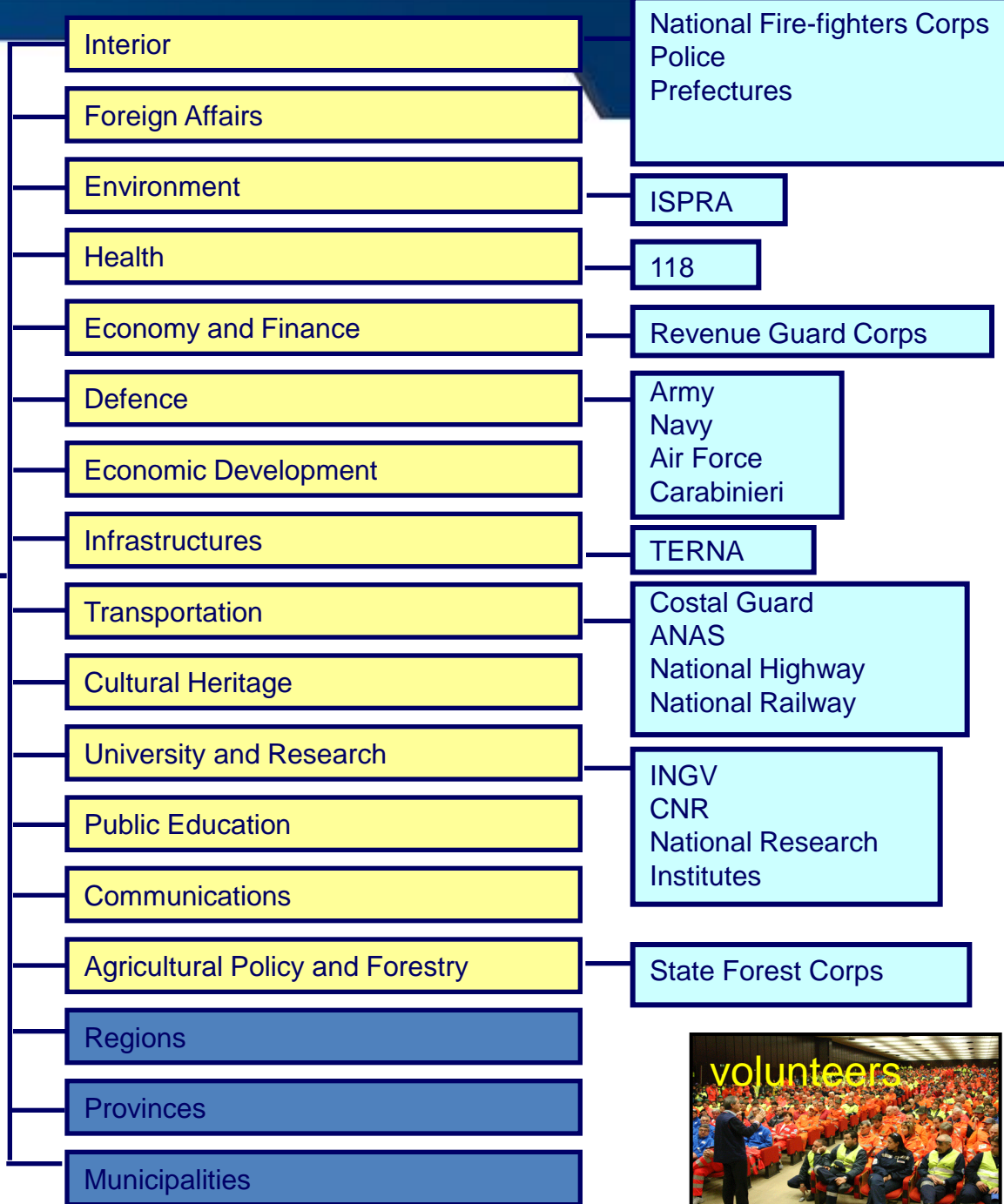


PRESIDENCY
OF THE
COUNCIL
OF
MINISTERS

Department
of Civil
Protection

Coordination activity

*Citizens and any other
public and private
institution in the territory
contribute to civil
protection activities*



NATIONAL SERVICE OF CIVIL PROTECTION

(Law n. 225 /1992)

The National Service of Civil Protection operates at central, regional and local level, according to the PRINCIPLE OF SUBSIDIARITY

**2001: MODIFICATION OF THE
TITLE V OF THE CONSTITUTION)**



**CIVIL PROTECTION IS SUBJECT TO
CONCURRENT LEGISLATION**

BASED ON THE SUBSIDIARITY PRINCIPLE, EVENTS ARE CLASSIFIED AS:

TYPE "A" EVENTS:

Can be dealt with through actions that can be carried out by local administrations, ordinarily **MUNICIPALITIES**



**the MAYOR
is the first Civil Protection Authority**

TYPE "B" EVENTS :

for their nature and extension they need the coordinated action of several administration, ordinarily :
PROVINCE/REGION

TYPE "C" EVENTS :

for intensity and extension they must be tackled with extraordinary means and power by the
STATE

Mandate

The National Civil Protection System of Italy (Law 225/1992) aims at safeguarding human life and health, goods, national heritage, human settlements and the environment from all natural or man-made disasters.

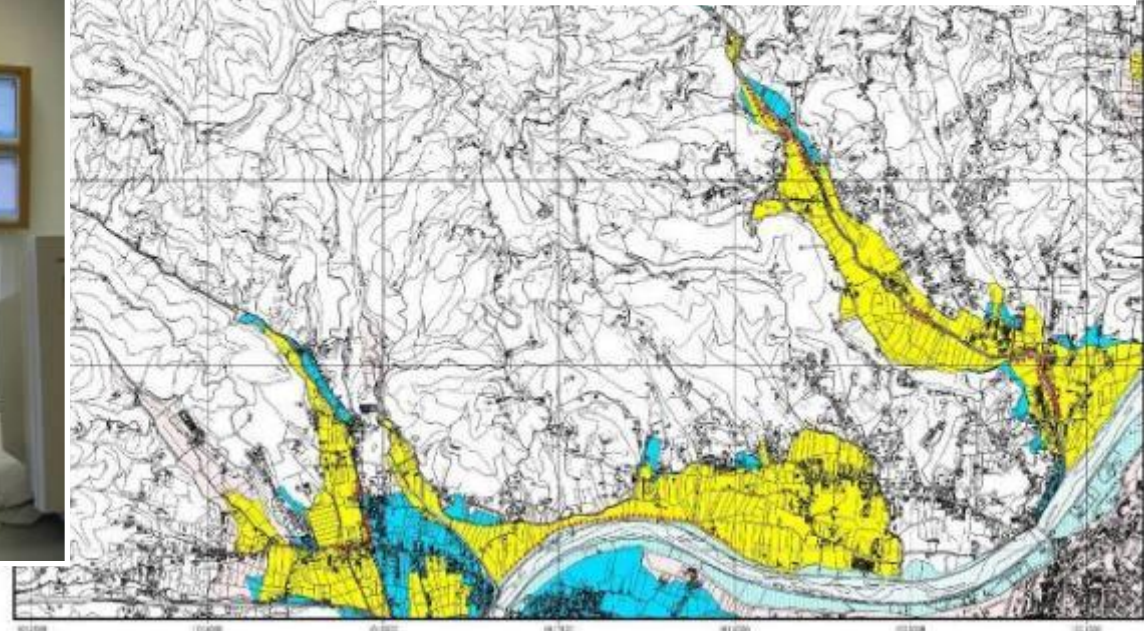
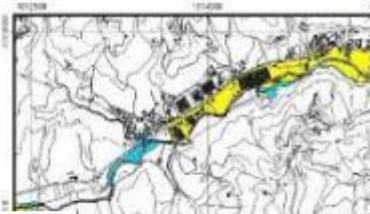
It deals with:

Forecasting and Warning
Prevention and Mitigation
Rescue and Assistance
Emergency overcoming

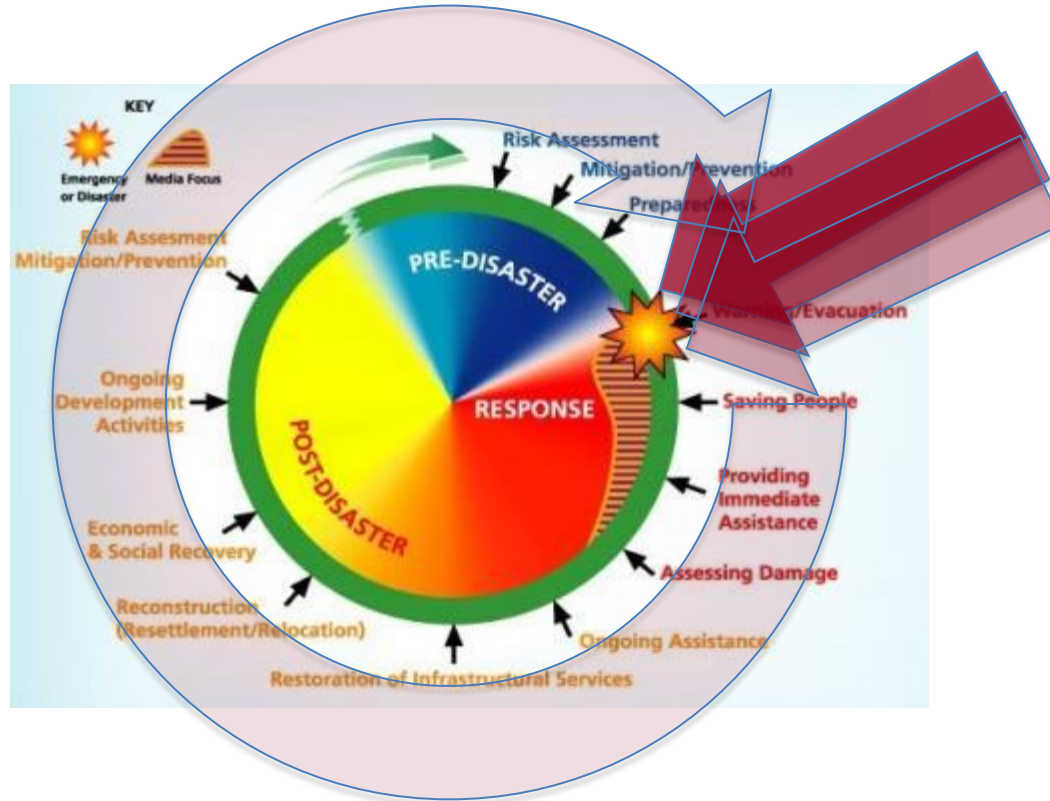


Forecasting and Warning

Activities aimed at recognising the causes of catastrophic events, identifying risks, and defining the affected areas.



“Prevision”

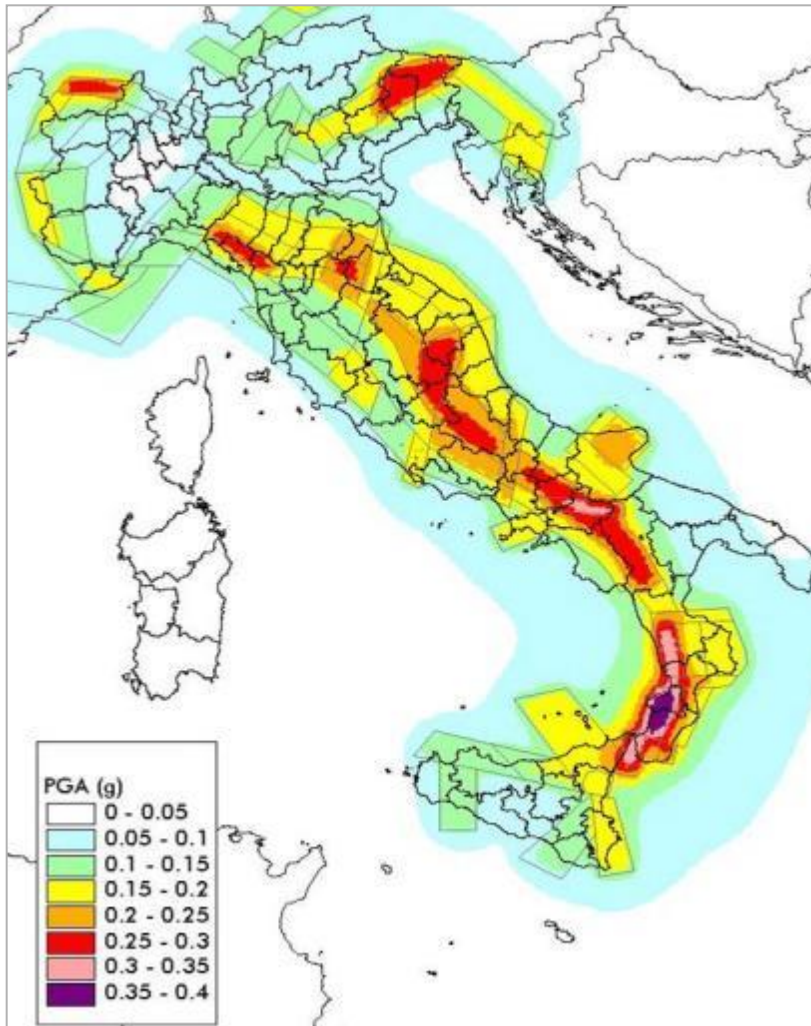


- There are **deep differences among natural phenomena** in terms of predictability;
- In all cases, it is impossible to make deterministic predictions, **only a probabilistic forecasting is possible;**
- **Different phenomena have very different probabilities** from very low (<1%) to high (some tens %), also depending on the **spatial and time definition** and on **the time lapse** for which the event must be anticipated;
- The (probabilistic) forecasting can be carried out in a **short-to-intermediate-to-long term perspective;**
- A **forecast** can be released both for a **hazard** (occurrence of a certain natural phenomenon) and for the related **risk**.

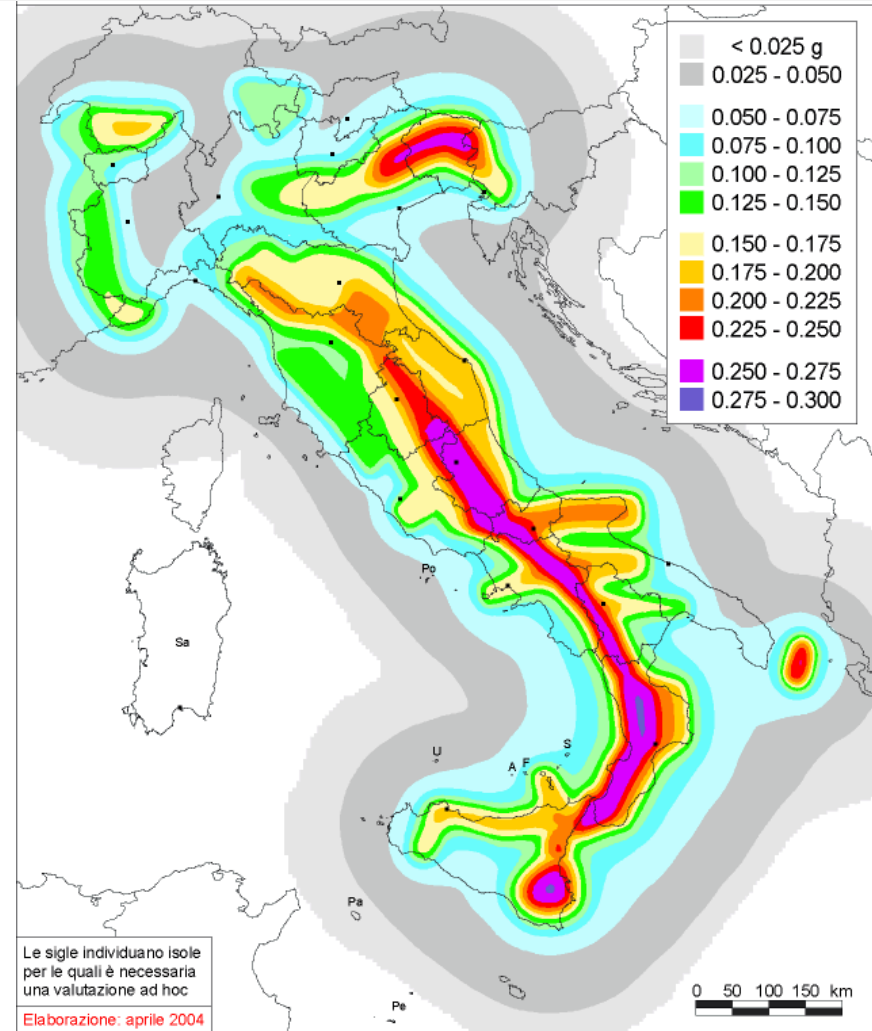


Hazard assessment

Example of hazard maps: Peak Ground Acceleration (PGA) values with a 10% probability of exceedance in 50 years, (475 years return period)



SSN-GNDT 2000

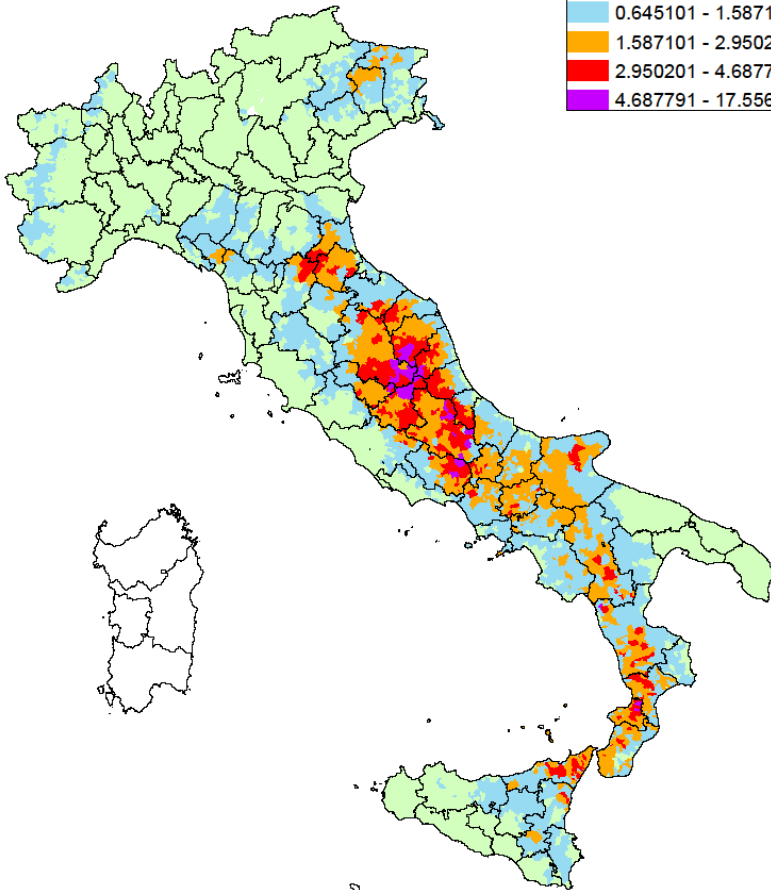


INGV 2004

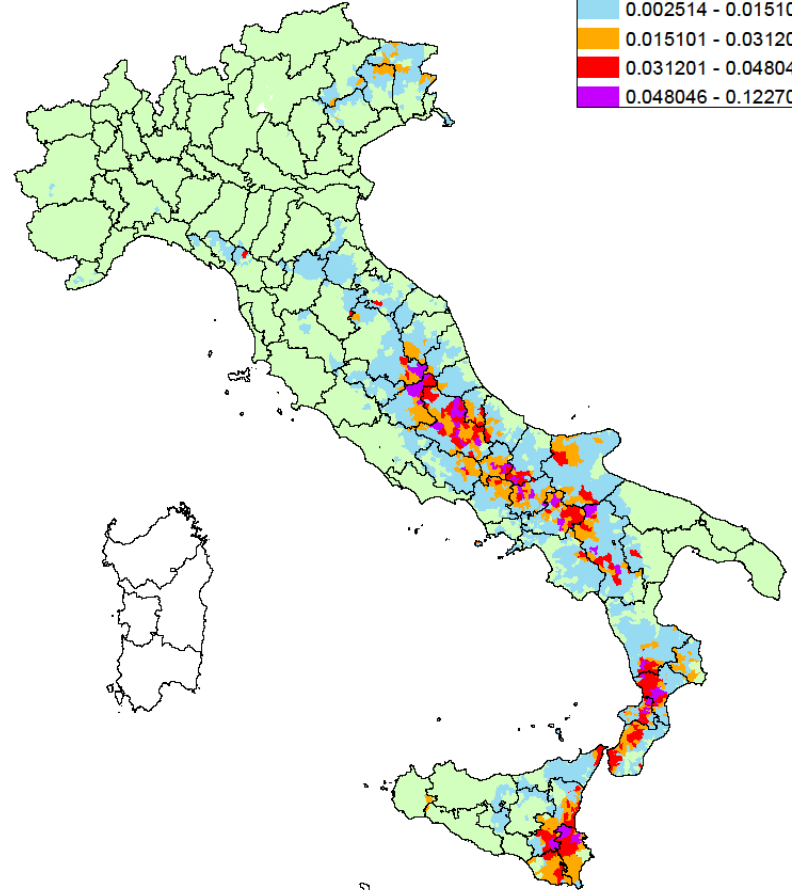
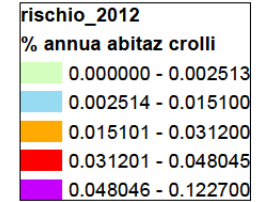
Seismic risk maps



Considering the large amount of funds required for strengthening and retrofit of the Italian real estate, it's essential to establish a scale of priority based on national seismic risk maps



Percentage of the damaged dwellings expected per year in each municipality (LOSS RISK)



Percentage of the collapsed dwellings expected per year in each municipality (LIFE RISK)

A **prevision** is aimed at making the following activities more effective:

- **Prevention** related to an **immediate risk** (short term), for instance through evacuations or alerts to the population;
- **Prevention** related to the **residual risk** (short term), for instance through the identification of areas particularly at risk in the post-event phase, or through the correct calibration of post-event activities;
- **Rescue and assistance** to the population (short term), for instance through the preventive deployment of emergency services and/or the preparation of tent camps, shelters, etc.;
- **Structural prevention** (intermediate-to-long term), through policies aimed at best distributing the (limited) resources.

Prevention and Mitigation

Activities aimed at avoiding or minimizing the possibility of damage occurrence due to the considered events.

WELCOME TO STROMBOLI
One of the most beautiful and fascinating islands in the Mediterranean sea

The Island of Stromboli is special and unique and its ecosystem is an enchanting mix of beautiful coasts, volcanic sand beaches, wonderful sea and typical vegetation.

But Stromboli is... also an active volcano

In order to let you enjoy in safety the Island and its fantastic beauties, we remind you that - due to the recent intense activity of the volcano - in accordance with ordinance n. 121/02 of December the 30th 2002, excursions to the top of the volcano are strictly forbidden. Do not enter in the area bounded by the blue line on the map. There is no restriction regarding the beaches and the residential areas.

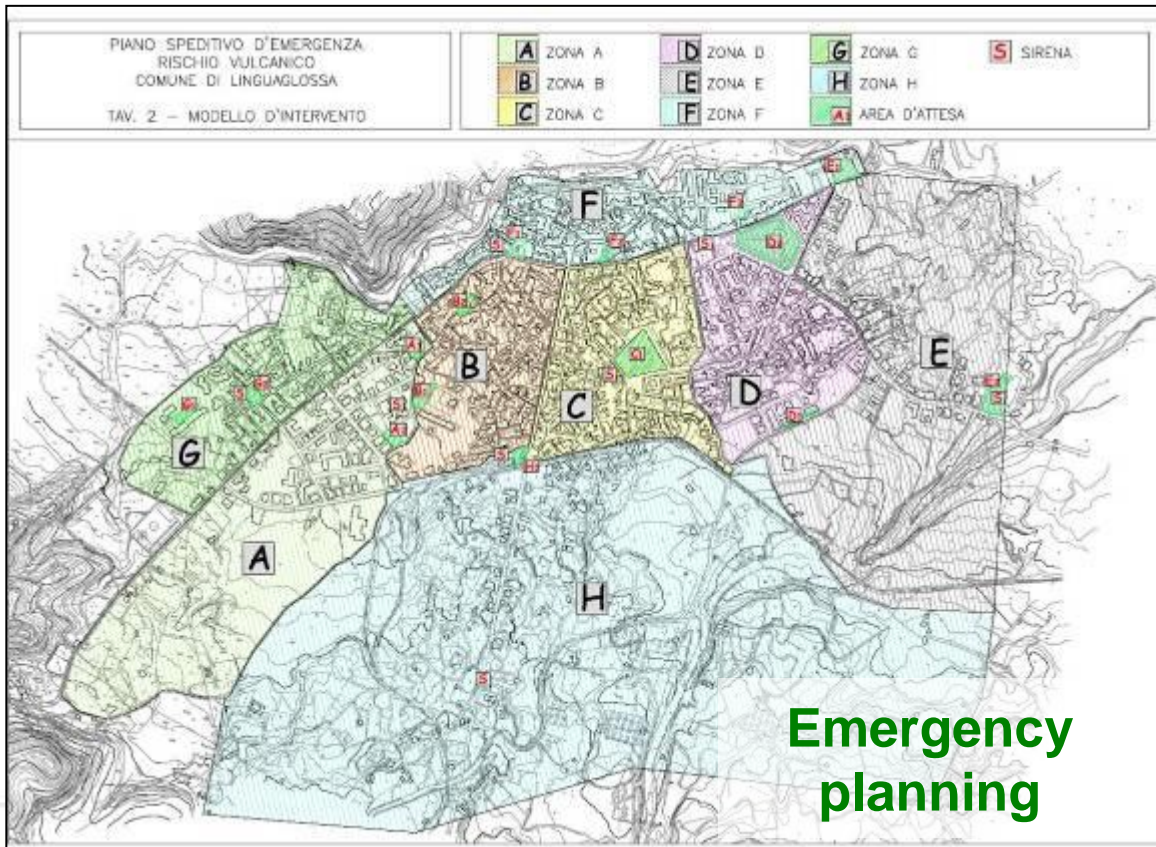
In the very exceptional event of tidal waves, an alarm siren will warn of the danger. Please leave the seaboard as soon as you can and go inland. The inhabitants of Stromboli will indicate you the safety areas.

To make your journey more pleasant and interesting, contact the official guides. They know the beauties of the island and the dangers of the volcano, and will advise you, give all the information you need and assist you in your safe exploration of this extraordinary world.

Enjoy your stay in STROMBOLI!

Info:
City of Lipo
Volcanological Service
Info: www.comune.stromboli.li

Information



Prevention

Structural vs. non-structural

Seismic structural prevention

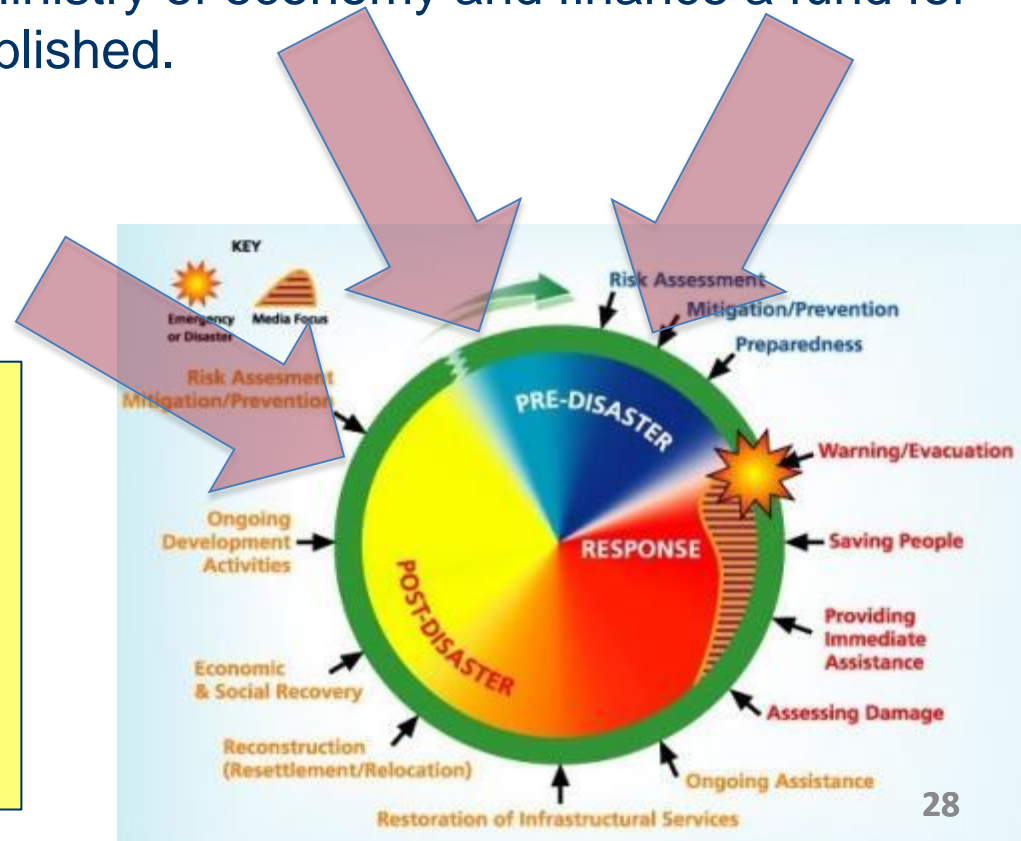
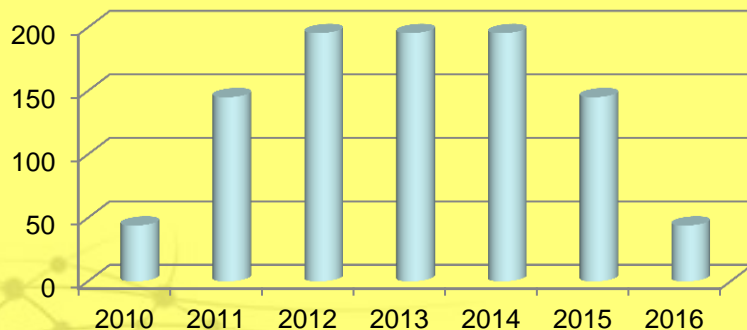
Law n. 77 24.06.2009 - Article 11

Interventions for seismic risk prevention

1. In the state of prevision of the Ministry of economy and finance a fund for the seismic risk prevention is established.

At this aim **965 M € (963.5)** were made available in seven years, from 2010 to 2016.

Annual funding (M€)



Italian example of intervention for vulnerability reduction



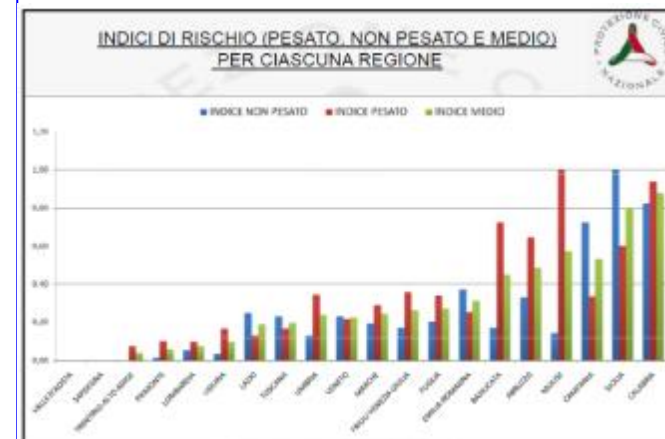
Decree n. 39, 28/4/09, → Law n. 77 24/6/09 (Art. 11)

A budget of **963 M€** has been allocated for the years 2010-2016 for activities of seismic risk reduction in Italy:

- Seismic microzoning studies
- Vulnerability reduction of public strategic and private buildings
- Vulnerability reduction of infrastructures in urban areas

Funds are distributed among different Italian regions on the basis of a seismic risk index linked to the probability of building collapse (seismic risk maps) only in the municipalities where $PGA \geq 0.125$ g

The total amount of about **1 billion euro** represents a very low percentage, probably **lower than 1%**, of the budget required in Italy for the seismic retrofit of all private and public buildings and strategic infrastructures. However it is definitely a step forward for an increase of the **knowledge of the importance of seismic prevention**

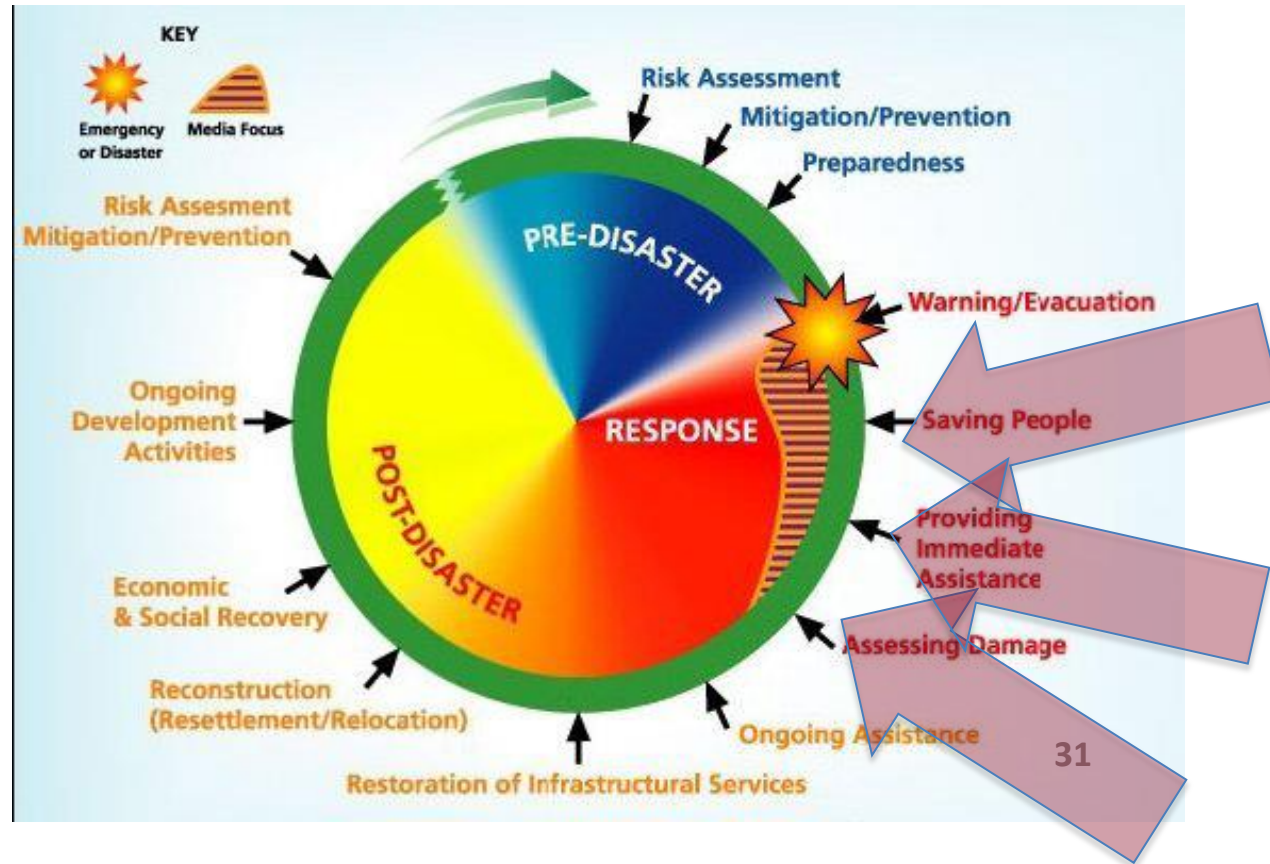


Law n. 77 24.06.2009 - Article 11

Ordinance PCM 3907 (2010) → APPROACHING THE PROBLEM

1. Addressing the problem as a whole, also soliciting actions related to **seismic microzonation and strengthening of public buildings, private buildings, urban infrastructures.**
2. Stimulating the attention of private owners and administrators to promote the **culture of prevention.**
3. Asking local administrations and private owners to **cofund prevention actions**, in order to multiply the effects of the budget allocated.
4. Aiming at **reducing risk for human life**, thus focusing the **interventions on the highest hazard zones** and on the most vulnerable structures, and promoting the **upgrade of the emergency plans.**

Rescue and Assistance



Rescue and Assistance

Activities aimed at providing the population affected by a catastrophic event with all the first assistance needed.

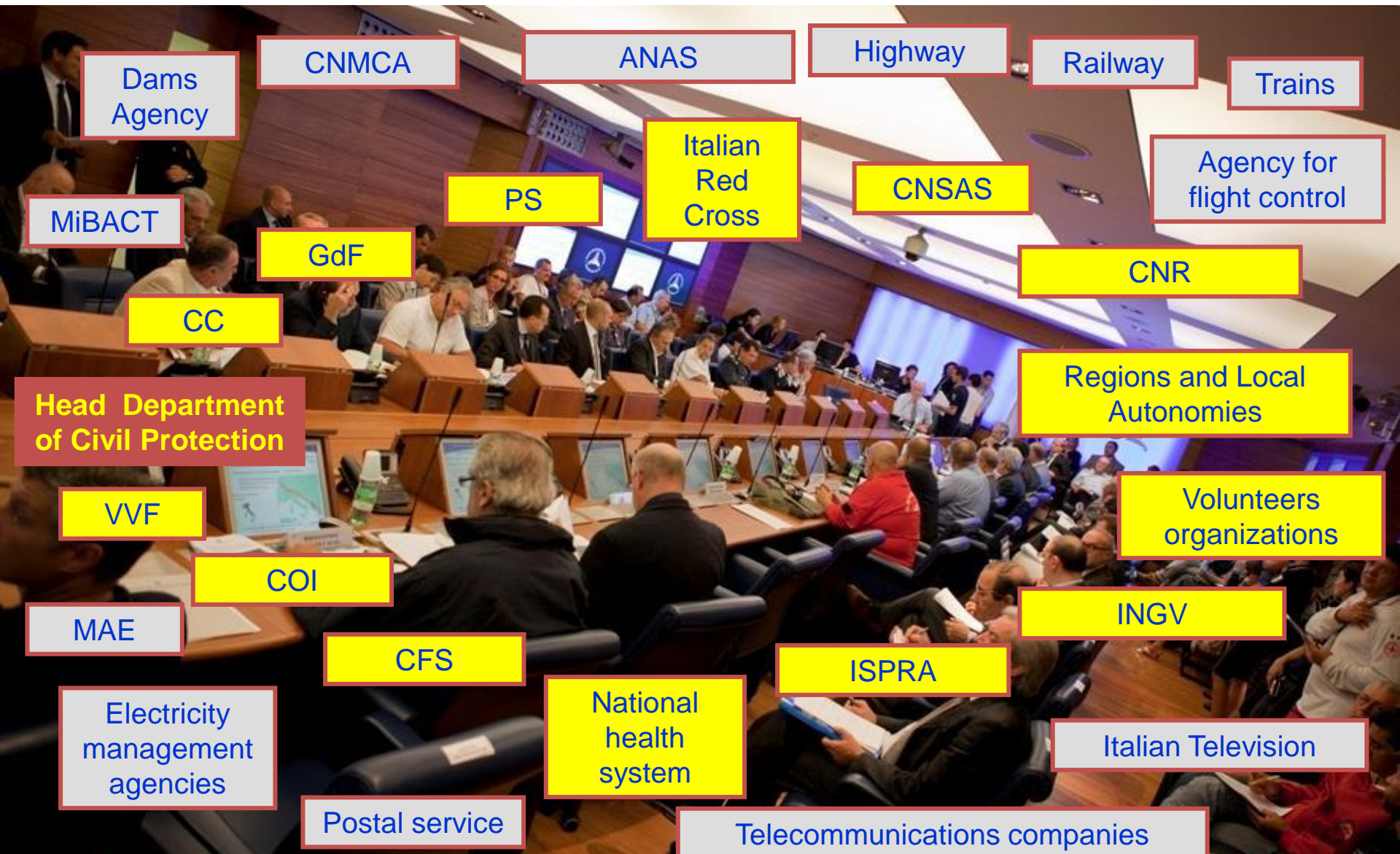


Emergency Management



The Operational Committee

is convened within the Department of Civil Protection to ensure a unified direction and coordination of emergency management



Dams Agency

CNMCA

ANAS

Highway

Railway

Trains

MiBACT

PS

Italian Red Cross

CNSAS

Agency for flight control

GdF

CNR

CC

Head Department of Civil Protection

Regions and Local Autonomies

VVF

Volunteers organizations

COI

INGV

MAE

CFS

ISPRA

Electricity management agencies

National health system

Italian Television

Postal service

Telecommunications companies

ACTIVATION OF SEARCH AND RESCUE TEAMS



ACTIVATION OF REGIONAL MOBILE MODULES



ACTIVATION OF EMERGENCY RADIO- AND TELE-COMMUNICATIONS



iov.it

PREPARATION OF OPERATIONAL CENTRES



MANAGEMENT OF TEAMS FOR TECHNICAL SURVEYS, DAMAGE AND USABILITY ASSESSMENT OF ORDINARY BUILDINGS, AND EVALUATION OF INDUCED RISKS



ACTIVATION OF NATIONAL ASSOCIATIONS OF VOLUNTEERS



DEPLOYMENT OF PMA AND FIELD HOSPITAL





TEMPORARY ACCOMMODATION AREAS



INTERNATIONAL SUPPORT





NATIONAL LEVEL



c

REGIONAL LEVEL

b

PROVINCIAL LEVEL

a

MUNICIPALITY LEVEL

DISASTERS

**state of emergency
(governmental declaration)**

Department of Civil Protection



Head of the DPC / Commissario Delegato (L. 286/2002)

Operational Committee

Major risks Commission

National conference of civil protection volunteers

State-Regions Committee

Central Functional Centre

Direction of Command and Control

DPC Operational Room

Region

Regional Functional Centre

Regional Operational Room

Civil Protection Regional Fund (L. 388/2000)

Regional Volunteers (L. 112/98)

Province

C.C.S.

C.O.M./C.I. Com. Montana

C.O.M./C.I. Com. Montana

C.O.M./C.I. Com. Montana

Municipality

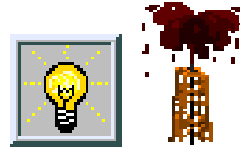
Major, first authority of civil protection
C.O.C.



Support Functions



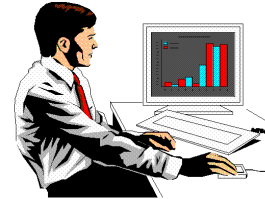
F.1 Technical and Planning



F.8 Essential services



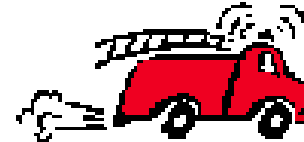
F.2 Health



F.9 Damage assessment to people and goods



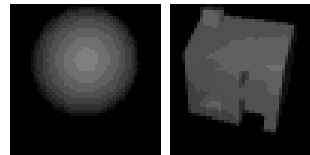
F.3 Mass-media and Information



F.10 Operational structures



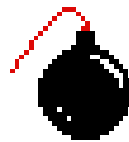
F.4 Volunteers



F.11 Local administrations



F.5 Means and materials



F.12 Dangerous materials



F.6 Transports and viability



F.13 Assistance to population



F.7 Telecommunications



F.14 Coordination of operational centres

Non siete connessi al sistema automatico !!!\Tokyo\D\$

Ora GMT : 19:08:55 Ora Locale : 20:08:55
 Pulisci mappa >> Visualizza un punto >>
 Lat. **43.641** Long. **13.03**

Mappe Sismicità Mini GIS Log Visualizza Eventi Controlla Acquisizione Stampe

Lista eventi sismici **Tokyo** **Kyoto**

sabato 21 ottobre 2006

- EV_0704_A_04.txt
- EV_0704_A_05.txt
- EV_0704_A_06.txt
- EV_0704_A_07.txt
- EV_0704_A_08.txt
- EV_0704_A_09.txt
- EV_0704_A_10.txt
- EV_0704_A_11.txt
- EV_0704_A_M1.txt
- EV_0704_A_M2.txt
- EV_0704_A_WW.txt
- EV_0704_A_XX.txt
- EV_0758_A_01.txt

Evento : 0704
 Def. E-mail WW Tele.
 19 : Eventi def. XX
 EV_0156_A_XX.txt
 EV_0348_A_XX.txt
 EV_0633_A_XX.txt

- Opzioni di visualizzazione
- Visualizza localizzazioni temporanee
 - Visualizza stazioni non triggerate
 - Visualizzare più eventi alla volta
 - Visualizza etichetta dell'evento
 - Visualizzare solo le riviste WW

Scegli un operazione :

Visualizza dettagli Rilocalizza Evento Evento su Mappa AGENDA Comunicati Pro. Civ.

Zona **Metauro**

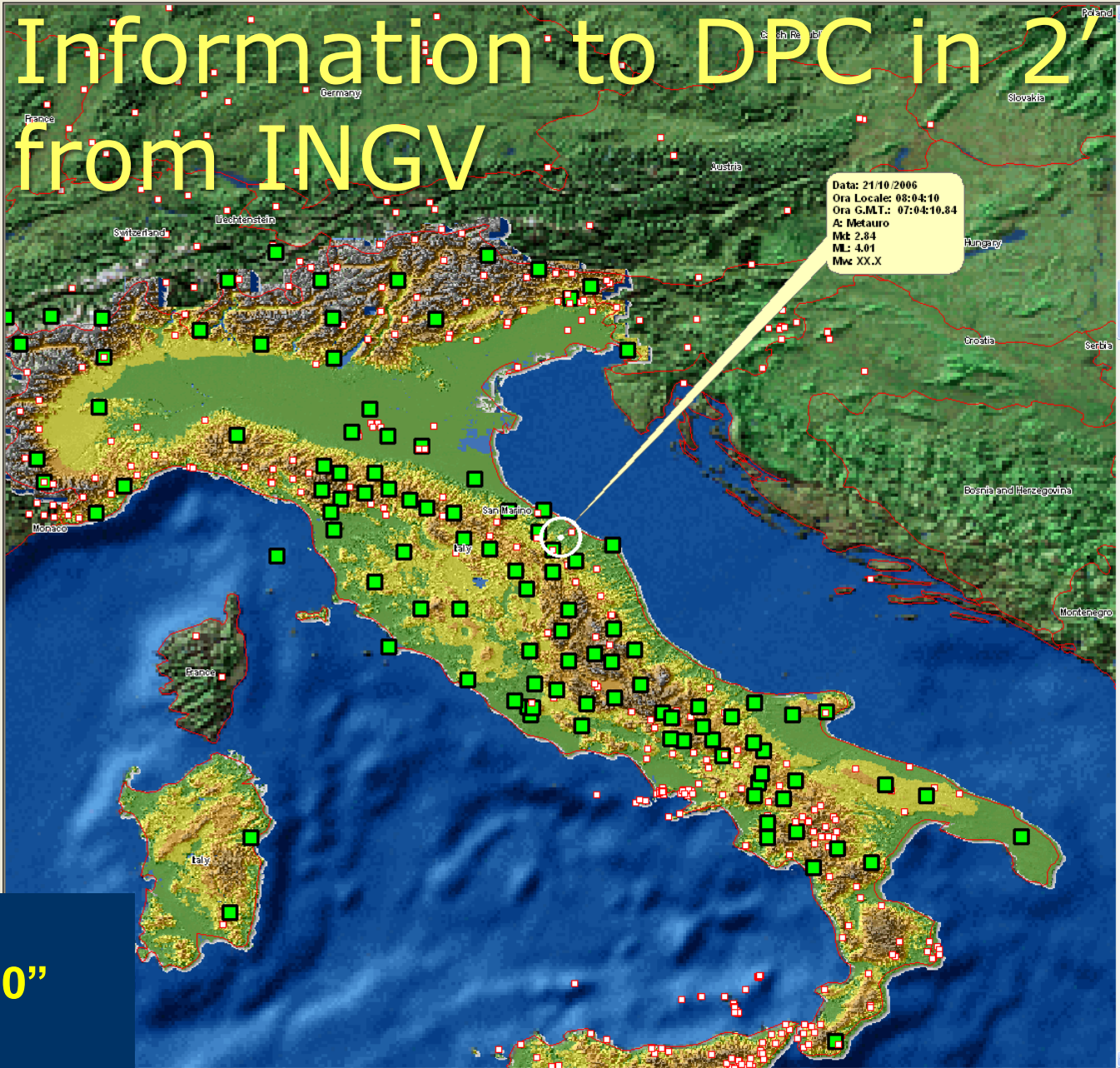
Dati Dell'evento selezionato

Tipo Loca. **XX** Qualità Loca. **BA** Md **2.84** MI **4.01**
 Profondità **38.4 Km** BUONA Ms **XXX** Mw **XXX**
 Data **21/10/2006**
 Ora **07:04:10.84 GMT**
 Lat./Long. **43.641** **13.03** Numero Stazioni **0128**

Num	Nome	Peso	Distanza in (Rete
1	FSSB	81	19	IV
2	CING	99	29	IV
3	PESA	98	33	IV
4	BADI	23	58	IV
5	ADI	100	42	IV
6	MURB	86	53	IV
7	RSM	95	51	IV
8	CDCA	91	61	IV
9	SNTG	34	39	IV
10	ASS	88	64	IV

Calcolo Magnitudo Durata
 Durata in mm Magnitudo Intensità

Event ID = 1193569040 Del : 21/10/2006 Ore : 07:04:10.84

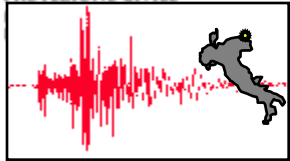


Information to DPC in 2' from INGV

Example M 4.0
First locations after 30"
Final after 120-200"
ML based on 159 channels



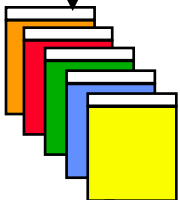
SIGE - Information System for Emergency Management and simulation scenarios



ING seism. network



DPC



Maps and reports

Emergency Management

- In the first hours following an earthquake is of primary importance to know the consequences of the event for the emergency management and rescue organization. Such a target can be achieved by simulating damage and loss scenarios, based on the focal parameters of the event and on the information related to the seismicity and vulnerability of the affected area. Particularly useful is the use of a G.I.S.
- In case of an earthquake, of magnitude 4 or more, an automatic procedure is immediately activated by SIV to produce data, maps, and information concerning the epicentral area
- On the basis of attenuation relations , several ground motion parameters (intensity, PGA, PGV, spectral values) are calculated for each municipality within a radius of 100 km from the epicenter. These values are used to give a preliminary evaluation of the damages and losses
- **Several maps and data, giving a complete description of the main features of the stricken area are compiled and ready as a report within 30 minutes from the causative event**

Emergency management : Loss scenarios



Example of outputs provided by SIGE for L'Aquila M= 6.3 event of April 6 2009

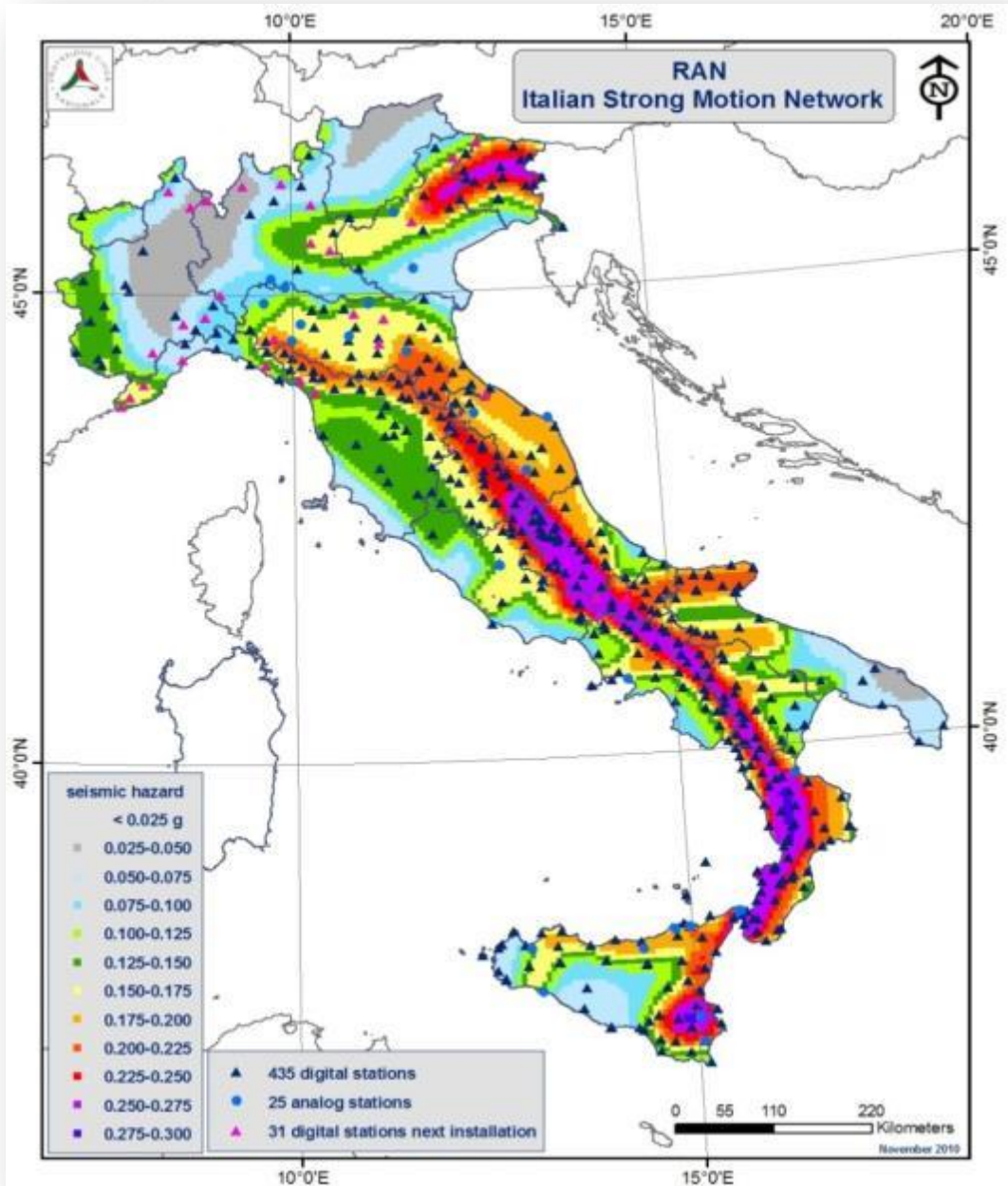
	Estimates of the Simulation scenario			Real data (source DPC www.protezionecivile.it)
	Min	Max	Mean	
Maximum Mercalli Intensity (MCS)		VIII-IX		IX
People involved in building collapse	200	2200	1200	1900*
Homeless	8700	54000	31000	62000**
Unusable dwellings	6700	38000	22000	39000***

SIGE - Information System for Emergency Management and simulation scenarios



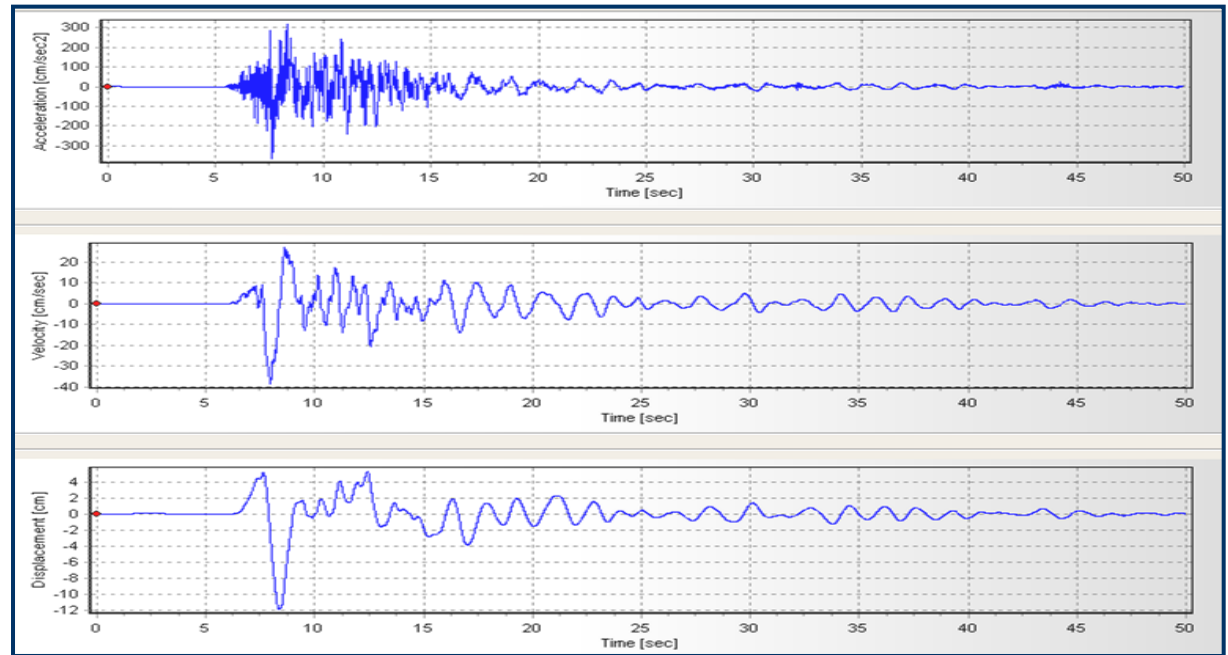
Expected number of people involved in building collapse

National accelerometric network (RAN-DPC) operated by SIV



- Installation began in 1972 under the management of *ENEL* (Italian Electricity Board).
- Acquired in 1998 by *DPC* (237 analog stations).
- **More than 500 digital instruments** installed in free field with an average spacing of 15 km.
- Digital instruments (Kinematics Etna or Everest 18-24 bits) are equipped with GSM or GPRS modem for data transmission to the central (Rome) acquisition centre.
- More than 4000 records obtained in 40 years of activity.
- annual cost of management and maintenance ~2 M€.

57 stations recorded the Abruzzo Earthquake on April 6 2009 at 3.32 a.m.







Data were immediately put at disposal of the scientific community through the DPC and through the ITACA web-sites

Strong motion recording on structures: OSS



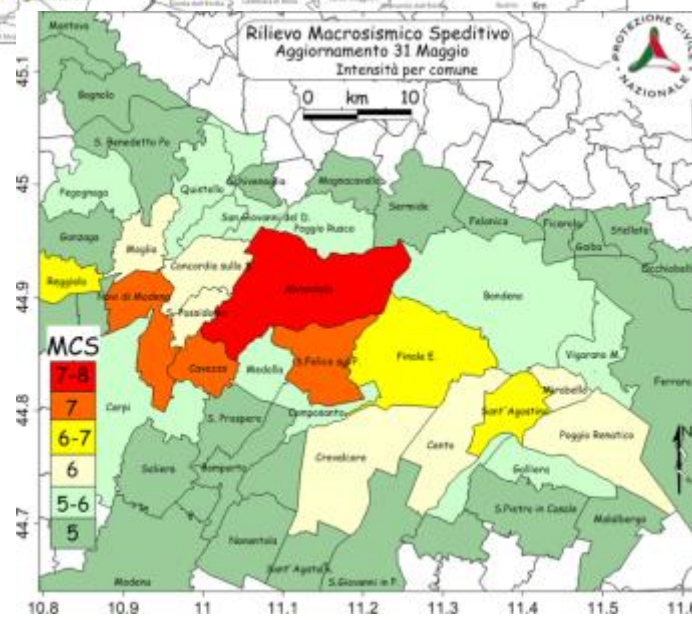
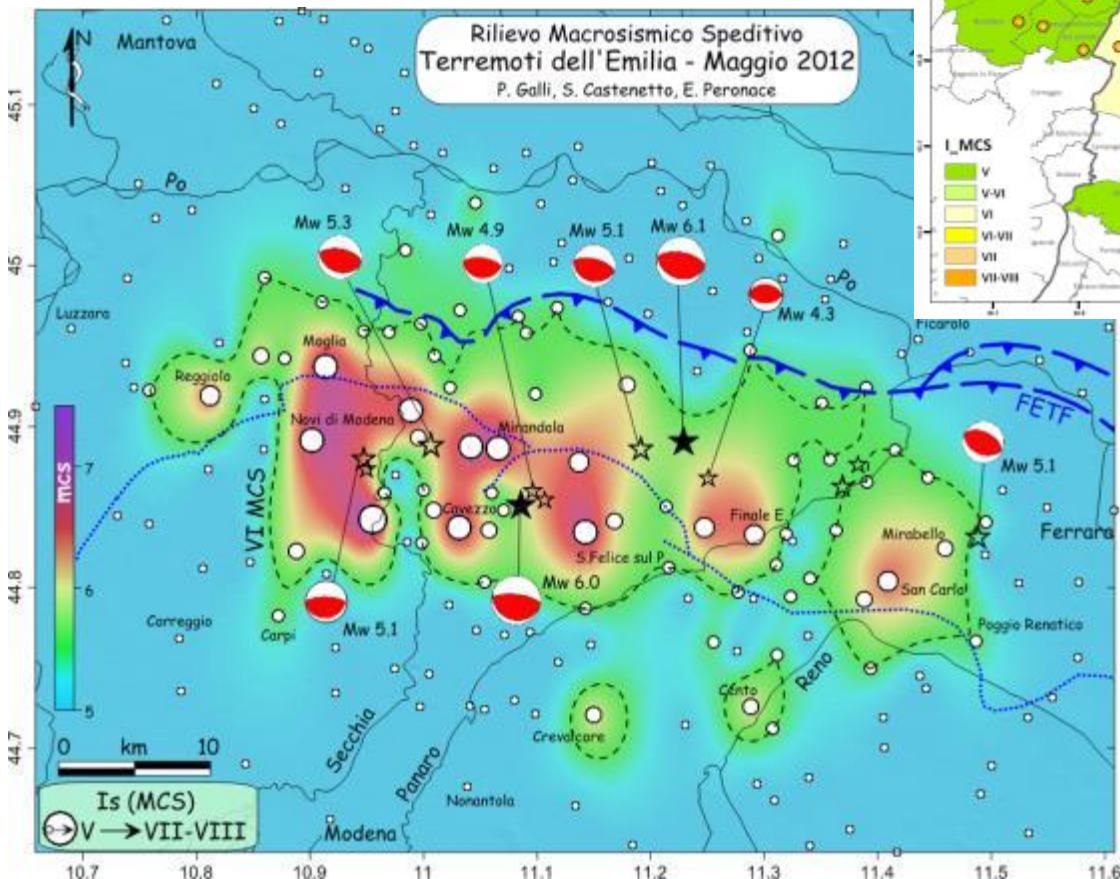
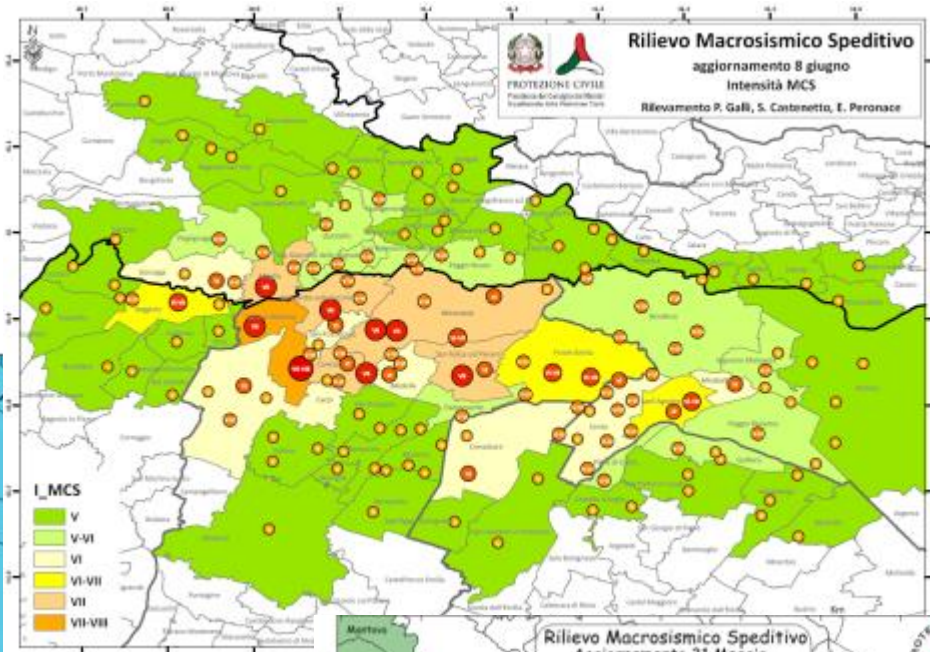
The OSS Main Network with complete instrumentation

 R.C. structure	 Masonry structure	120 PUBLIC BUILDINGS
 Bridge	 Dam	7 BRIDGES AND 1 DAM

The **Seismic Observatory of Structures (OSS)** records in quasi-real time the dynamic response of about 150 structures (schools, hospitals, city halls, bridges, dams...) in case of strong earthquakes

Macroseismic survey for CP purpose

Emilia 2012
MCS Scale (195 localities)



POST EVENT : damage survey and safety assessment



Presidenza del Consiglio dei Ministri
DIPARTIMENTO DEI SERVIZI
TECNICI NAZIONALI



Presidenza del Consiglio dei Ministri
DIPARTIMENTO NAZIONALE DELLA PROTEZIONE CIVILE

Consiglio Nazionale delle Ricerche
GRUPPO NAZIONALE PER LA
DIFESA DAI TERREMOTI



1st LEVEL FORM FOR DAMAGE EVALUATION, QUICK INTERVENTIONS AND USABILITY OF BUILDINGS IN THE SEISMIC EMERGENCY (Ver. 09/98)

SECTION 4 Damage to STRUCTURAL ELEMENTS and provisional interventions already carried out

Level - extension Structural - components Pre-existing damage	DAMAGE ⁽¹⁾										MEASURES TAKEN					
	D4-D5 Very serious			D2-D3 Serious			D1 Light			None	None	Demolitions	Tie-beams	Restorations	Props	Barriers and passage protections
	> 2/3	1/3 - 2/3	< 1/3	> 2/3	1/3 - 2/3	< 1/3	> 2/3	1/3 - 2/3	< 1/3	None	A	B	D	F	H	L
	A	B	C	D	E	F	G	H	I	L	A	B	D	F	H	L
1 Vertical structures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 Horizontal structures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 Stairs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 Roofing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 Curtain walls, partitions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 Pre-existing damage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(1) - For each level provide the extent of damage only if present. If the object on the line is not damaged tick off None.

SECTION 8 Safety assessment

RISK ASSESSMENT					SAFETY RESULT	
RISK	STRUCTURAL (Sect. 3 e 4)	NON STRUCTURAL (Sect. 5)	EXTERNAL (Sect. 6)	GEOTECHNICAL (Sect. 7)	A	B
LOW	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	SAFE building	<input type="checkbox"/>
LOW WITH MEASURES	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	SAFE WITH QUICK INTERVENTIONS but temporarily not safe	<input type="checkbox"/>
HIGH	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	PARTIALLY UNSAFE building	<input type="checkbox"/>
					TEMPORARILY UNSAFE to be carefully reviewed	<input type="checkbox"/>
					UNSAFE building	<input type="checkbox"/>

UNSAFE UNITS, FAMILY AND PEOPLE EVACUATED

N. of unsafe units Families evacuated N. of people

Among post-earthquake activities, a significant issue is the damage and safety assessment for post-earthquake usability.

Usability defines the limit between people coming back to their houses and people waiting in provisional shelters or in temporary houses.

Since 1997 a specific form (AeDES) is used in Italy for damage assessment, short term countermeasures and evaluation of the post earthquake usability of ordinary buildings.



Post-earthquake usability evaluation is a quick and temporarily limited assessment, based on expert judgement, on visual screening and on data easily collected, aimed to detect if, during the current seismic crisis, buildings damaged by earthquake can be used, being reasonably safeguarded the human life.

A) USABLE	Building can be used without measures. Small damage can be present, but negligible risk for human life.
B) USABLE WITH COUNTERMEASURES	Building has been damaged, but can be used when short term countermeasures are provided
C) PARTIALLY USABLE	Only a part of the building can be safely used
D) TEMPORARY UNUSABLE	Building to be re-inspected in more detail. Unusable until the new inspection.
E) UNUSABLE	Building can not be used due to high structural, non structural or geotechnical risk for human life. Not necessarily imminent risk of total collapse.
F) UNUSABLE FOR EXTERNAL RISK	Building could be used in relation to its damage level, however it can not be used due high risk caused by external factors (heavy damaged adjacent or facing buildings, possible rock falls, etc.)

L'AQUILA EARTHQUAKE: BUILDING SURVEYS OF 76593 BUILDINGS

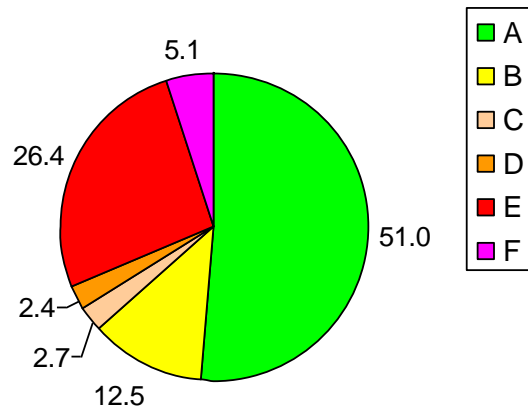
(www.protezionecivile.it - February 2010)

PRIVATE	PUBLIC	HOSPIT.	BARRACKS	SCHOOLS	INDUSTRY	CULT. HERIT
72543	2250	54	177	682	1337	1800

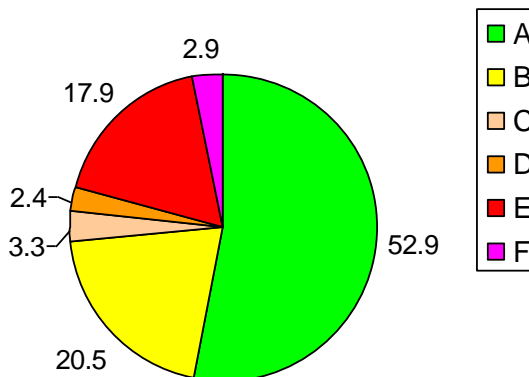
Percentage distribution of the private buildings

- 51,0%** **A SAFE** (Small damage can be present, but negligible risk for human life)
- 12,5%** **B SAFE WITH QUICK INTERVENTIONS** (temporarily unsafe)
- 2,7%** **C PARTIALLY SAFE** (Only a part of the building can be safely used)
- 2.4%** **D TEMPORARILY UNSAFE** (to be carefully reviewed)
- 26,4%** **E UNSAFE** (high structural or geotechnical risk for human life)
- 5,1%** **F UNSAFE FOR EXT. RISK** (heavy damaged adjacent buildings, possible rock falls, etc.)

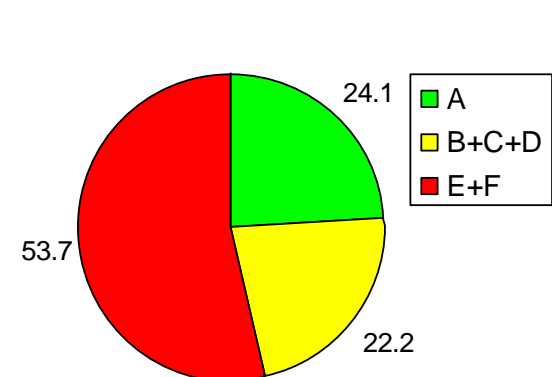
% distribution of usability classes for 72543 private buildings



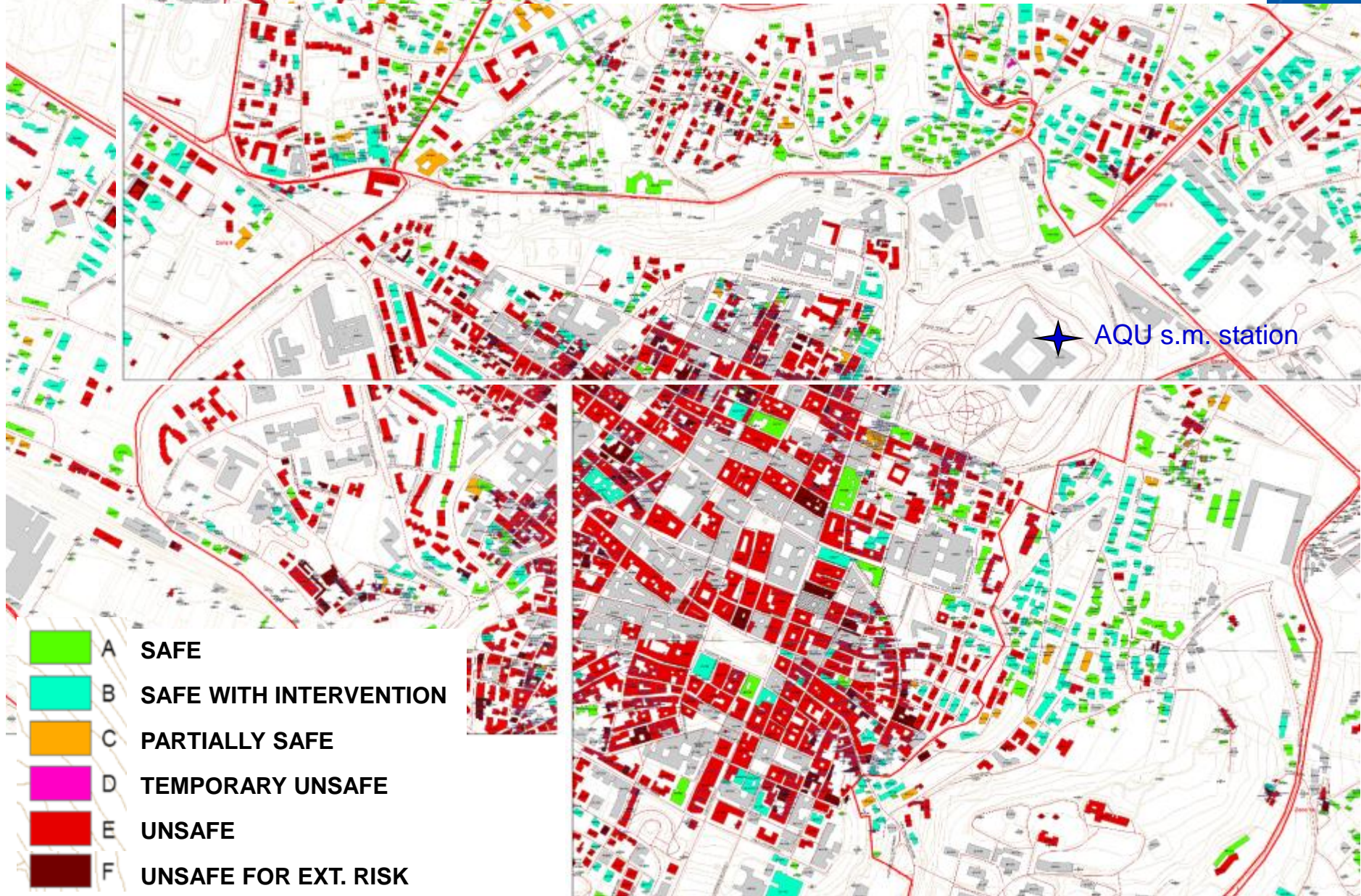
% distribution of usability classes for 2250 public buildings



% distribution of usability classes for 1800 churches and hist. blds.



Results of damage and safety surveys in the historical centre of L'Aquila



PROVISIONAL SAFETY MEASURES

Firefighters set out procedures and methods to optimise provisional works with the cooperation of the University of Udine



Basilica delle Anime Sante

The most complex provisional works on churches were designed with the consultancy of researchers

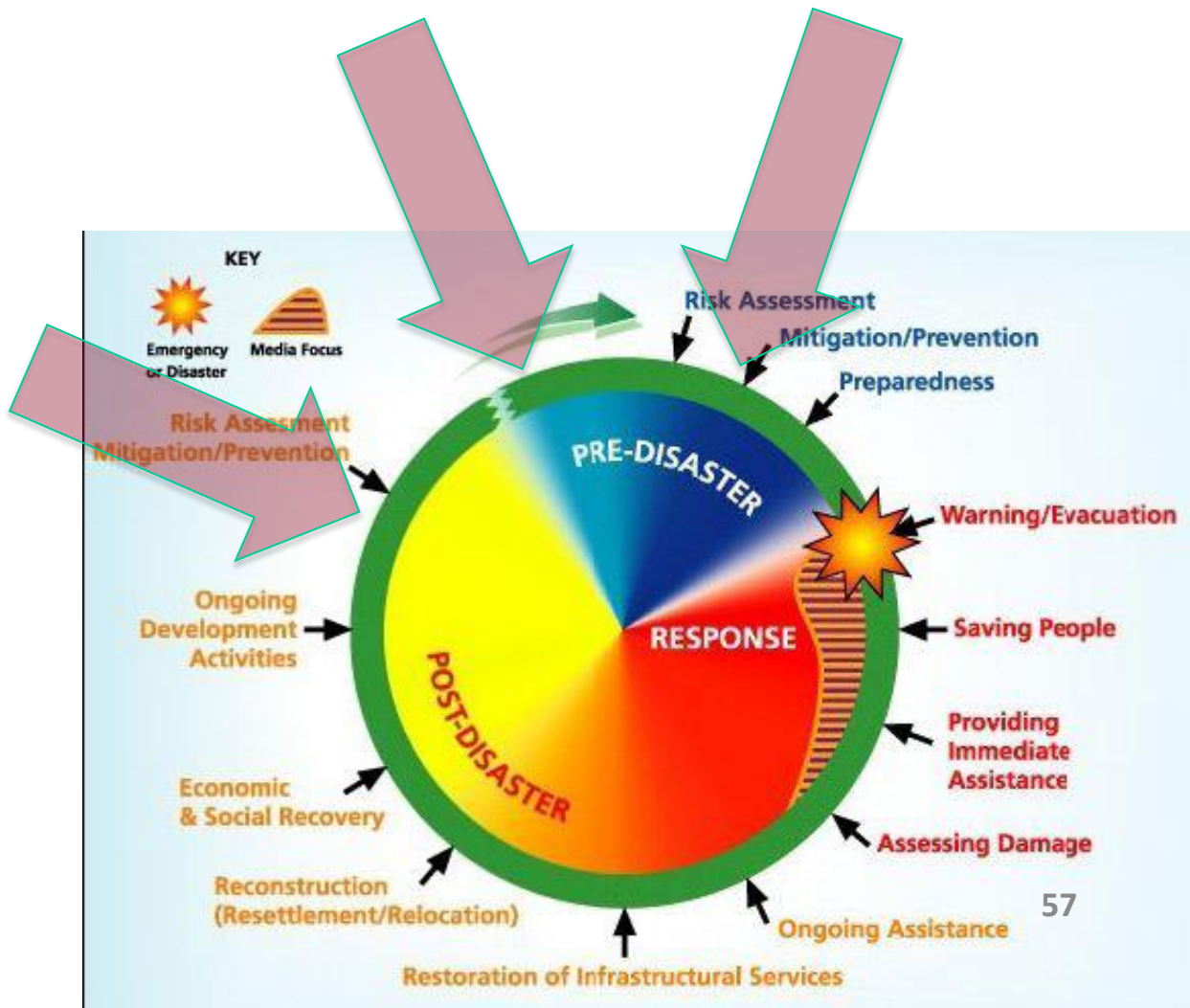


S.Maria di Collemaggio



Christmas mass
December 25, 2009

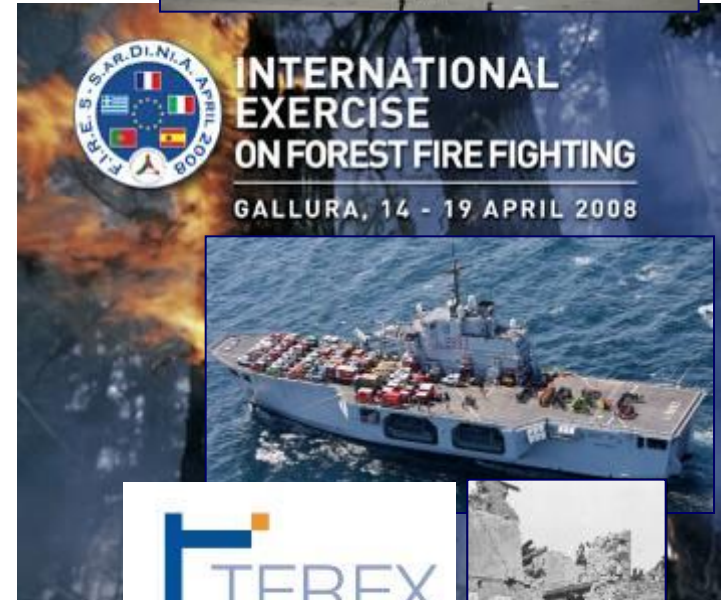
Preparedness



Exercises



FOREST FIRE EXERCISE - Aix en Provence April 2004



Emergency overcoming

All the activities aimed at removing obstacles towards normal life conditions.



Emergency overcoming

All the activities aimed at removing obstacles towards normal life conditions.



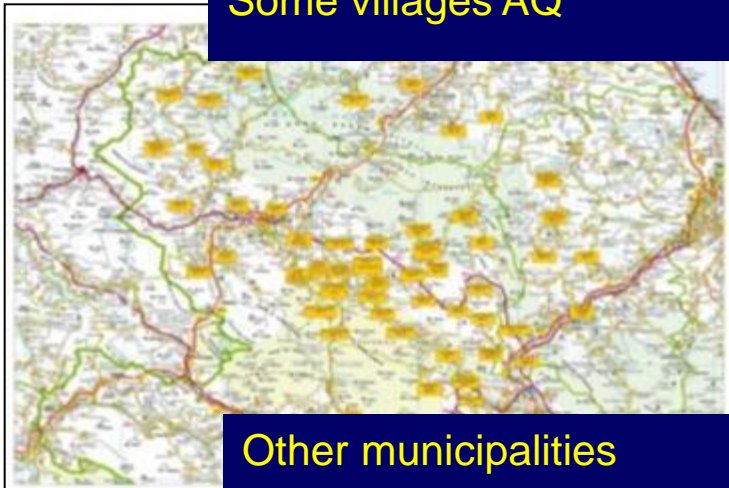
Temporary long-term housing solutions

~8000 houses for ~23500 homeless people available in few months



L'AQUILA

Some villages AQ



Other municipalities



4449 flats

complessi abitativi sostenibili ed ecocompatibili

c.a.s.e. M€ 800

1273 flats



2262 flats



M€ 231



*Tower of David Museum,
Jerusalem, ,19-20 January 2014*



*Workshop - Seismic Risk Preparedness
and Mitigation of Archaeological and
Historical Sites*

Seismic Risk and Civil Protection in Italy

*Prof. Mauro Dolce
Italian Department of Civil Protection*



PROTEZIONE CIVILE
Presidenza del Consiglio dei Ministri
Dipartimento della Protezione Civile