

<p>FIG Working Week May 6 – 10, 2012 Rome - Italy</p>	 PROTEZIONE CIVILE <small>Presidenza del Consiglio dei Ministri Dipartimento della Protezione Civile</small>
<p>May 9, 2012 Cavalieri Hotel: Ellisse room, Cadlolo str. 101, TS07L: "Land Administration in Post Conflict and Post Natural Disaster Areas"</p>	
<p>Giacomo Di Pasquale Italian Civil Protection Department - Seismic Risk Office Administration of Lands after Earthquakes – Italian Experiences (6255)</p>	
<ul style="list-style-type: none"> • Italian Civil Protection • Earthquakes in Italy, • L'Aquila april,6 post - earthquake experience • Seismic risk reduction in Italy. 	
<p>FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 1</p>	

<p>FIG Working Week May 6 – 10, 2012 Rome - Italy</p>	 PROTEZIONE CIVILE <small>Presidenza del Consiglio dei Ministri Dipartimento della Protezione Civile</small>
<p>Italian Civil Protection</p>	
<p>•Mandate of the National Civil Protection Service: protection of the human life, goods, urban settlements and environment against the threats posed by natural or man made disasters (Law n. 225/1992, art. 1).</p>	
<p>•Specific activities:</p> <ul style="list-style-type: none"> -Forecasting and warning -Prevention and risk mitigation -Rescue and assistance -Emergency overtaking 	
<p>FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 2</p>	



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*Nearly the entire Italian national territory is exposed to some type of major natural hazard. Throughout Italy's history, seismic tremors, hydrogeological events, forest fires and volcanic eruptions have periodically led to huge losses of human life and damage to property. Over the past century civil protection activities sporadically developed out of a series of ad hoc, local rescue interventions into a **systematic and institutionalized approach to forecasting, alert, emergency management and relief.***

FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 3



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The OECD Review Team has found:

Italy has implemented a coherent, **multi-risk approach** to civil protection that fully integrates scientific research and technological expertise into a structured system for forecasting and early warning of natural disasters.

With regard to its **delayed time activities**, the National Department of Civil Protection (DPC) provides strong support to **knowledge development of natural hazardous phenomenon** through a network of **competence centres**. It should continue and strengthen research efforts on the vulnerability of its population, building stock and critical infrastructures to risks associated with these phenomenon in partnership with competence centres and national research institutes ... High priority should be given to completing the national network of Functional Centres (CFSEs) in all regions and autonomous provinces..

FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 4

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Valuable **central government leadership** in the case of large scale disasters and national emergency management:

Situating DPC under the **President of the Council of Ministers** ensures that resources from all central government ministries, local government and the private sector **may be put to use rapidly and in a coordinated fashion to minimize consequences of large scale disasters.**

There are signs that **this model of joined-up efforts is gaining favour in different countries**, and that Italy stands out in its ability to coordinate different levels of public safety and security services.

FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 5

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The National Civil Protection Service (NCPS) incorporates a **well co-ordinated and highly mobile force of volunteer organisations** to fortify emergency response, relief and recovery activities.

There is nevertheless a **glaring disparity between the civil protection capabilities of many Italian municipalities**; some are well developed while others possess a low level of capacity for emergency Management – even in regions with very high risks of natural disasters.

This imbalance between risk and response capabilities calls for action to establish and maintain **minimum standards for crisis management** throughout Italy.

FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 6

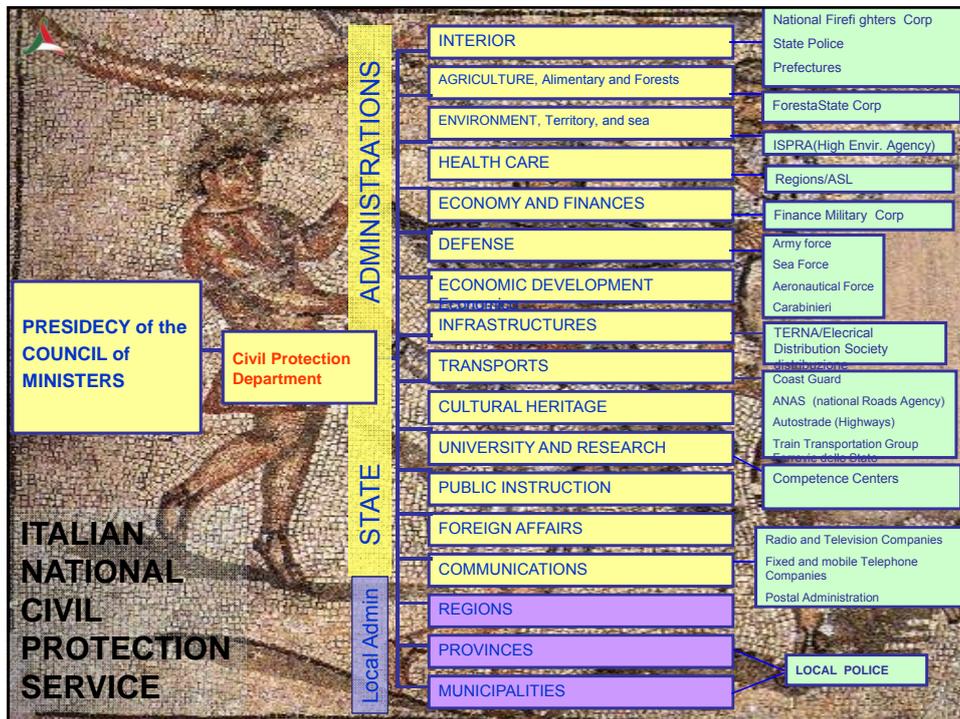


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Earthquakes in Italy

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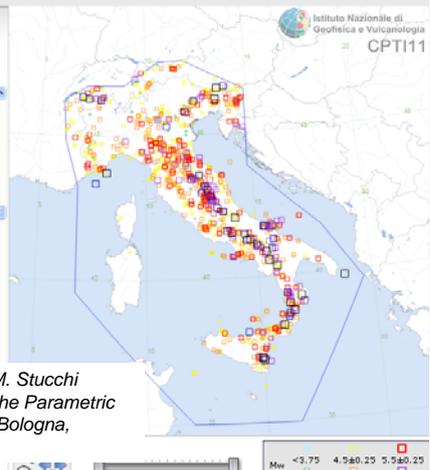
[CPT11 homepage](#) | [dal 1800 al 1899](#) | [dal 1900 al 2006](#) | [area Etna](#)

Blu terremoto con effetti macrosismici cumulati
Grigio terremoto non parametrizzato

Seleziona il terremoto facendo click sulla relativa riga

Data	AK	Np	I ₀	M _w
170211 14	SPELLO	7	5.14 ± 0.34	
170301 14 18:00	Appennino umbro-reatino	199	11 6.74 ± 0.11	
170301 16 13:30	Appennino umbro-reatino	22		
170302 02 11:05	Aquilano	71	10 6.72 ± 0.17	
170305 25 24:00	MONTECASSINO	6	4.72 ± 0.34	
170306 29 22:00	SPOLETO	7	5.14 ± 0.34	
170311 23	LJUBLJANA	6	4.72 ± 0.34	
170312 28	VILLAFRANCA	3	6.7 4.93 ± 0.34	
170405 13 12:15	Finale Ligure (SV)	2	5 4.30 ± 0.34	
170405 15 00:45	Finale Ligure (SV)	2		
170405 20	SPOLETO	7	5.14 ± 0.34	
170504 14 19:20	Senese	2	4 3.87 ± 0.34	
170511 29	CASSINO	7	5.14 ± 0.34	
170603 19	REGGIO CALABRIA	4	5-6 4.63 ± 0.72	
170603 28 24:00	TIROL	6	4.72 ± 0.34	
170611 03 13:00	Maiella	99	10-11 6.03 ± 0.16	
170612 02	TIROL	6-7	4.93 ± 0.34	
170703 24	ACQUASPARTA	8	7-8 5.13 ± 0.64	
170801				
171102				
171203				
171205				
171207				

Finestra tr Record totali: 1344



A. Rovida, R. Camassi, P. Gasperini and M. Stucchi (eds.), 2011. CPT11, the 2011 version of the Parametric Catalogue of Italian Earthquakes. Milano, Bologna, <http://emidius.mi.ingv.it/CPT1>

FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 9

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LA TROPICA DEL MAROCCO

Nella scorsa avevano perso la vita molte autorità e molti componenti della classe dirigente e rappresentativa. Risultava dunque essenziale, per affrontare la catastrofe, ricostruire rapidamente una catena di comando.

Dopo la scossa il capo di Stato Maggiore della 24^a Divisione militare di Messina, il maggiore Graziani, ottenne dal Prefetto una dichiarazione scritta con la quale l'autorità civile, viste le gravi circostanze, dava pieni poteri in terra ferma all'autorità militare.

Per comunicare la notizia del disastro e richiedere soccorso al Capo del Governo on.le Giolitti ed all'autorità militare più vicina, il maggiore Graziani, avendo la violenta scossa abbattuto i cavi telegrafici e telefonici e avendo subito danni anche i cavi sottomarini attraverso lo Stretto, si accordò con il capitano di corvetta Gerbino, ufficiale più alto in grado dell'incrociatore Piemonte, che aveva assunto il comando in capo delle forze navali di Messina, per inviare due torpediniere d'alto mare alla ricerca di un ufficio telegrafico funzionante sulla costa calabra e sicula, dal quale trasmettere le informazioni.

La torpediniera Scorpione riuscì ad inviare il telegramma al Presidente del Consiglio dei Ministri On.le Giolitti dalla Marina di Nicotera, sulla costa calabra, alle ore 13; mentre la torpediniera Serpente, dopo avere risalito inutilmente un tratto di costa a nord di Reggio ed essersi diretta a Stromboli, era



1915 Avezzano
30.000 dead



1930 Vulture
80.000 dead

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1971-80

- 1971: Viterbo, sisma, 21 dead
- 1973: Mitigliano (NA), landslide, 10 dead
- 1976: Friuli, sisma, **977** dead
- 1976: Friuli, sisma, 12 dead
- 1976: Seveso, industrial accident
- 1976: Trapani, flood, 16 dead
- 1978: Bologna, landslide/trasport, 47 dead
- 1978: Val D'Ossola (VB), flood/landslide, 18 dead
- 1979: Umbria, sisma, 5 dead
- 1980: Irpinia, sisma, **2917** dead
- 1982-4: Pozzuoli, bradisisma

DPR 66/81
Law 938/82

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- 1992: Zafferana Etnea, Volcanic eruption Law 225/92
- 1994: Piemonte, flood, 69 dead
- 1996: Versilia, flood, 13 dead
- 1996: Crotona, flood, 4 dead
- 1997: Umbria, earthquake, 11 dead Law 59/97
- 1998: Campania, debris flow, 160 dead Law 267/98
- 1999: Campania, debris flow, 5 dead Decree 112/98
- 2000: Soverato (CZ), flood, 12 dead Decree 381/99
- 2001: Catania, Volcanic eruption, Etna, rifugio, Sapienza Law 401/01
- 2000: Northern Italy, flood/landslides, 25 dead

Constit. Law n.3

- 2002: Macugnaga (VCO), glacial lake
- 2002: Catania, volcanic eruption Etna
- 2002: Santa Venerina (CT), earthquake
- 2002: Molise, earthquake, 29 dead

Law 286/02

- 2002: Northern Italy floods
- 2002: Stromboli (ME), volcanic eruption and tsunami
- 2003: Termini (CB), flood

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Law

401/01

2001: Catania, Volcanic eruption Etna, Sapienza building

Constit. Law n.3

2002: Macugnaga (VCO), glacial lake

2002: Catania, volcanic eruption Etna

2002: Santa Venerina (CT), earthquake

2002: Molise, earthquake, 29 dead

Law 286/02

2002: Northern Italy floods

2002: Stromboli (ME), volcanic eruption and tsunami

2003: Termoli (CB), flood

And so on....

FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 15

FIG Working Week

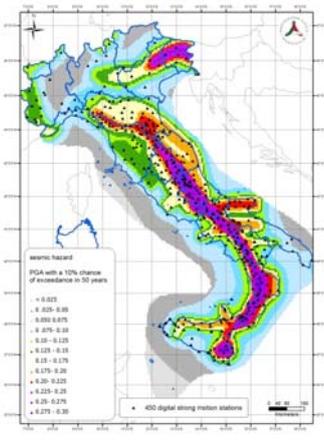
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Italian big Earthquakes 1970 – 2000: maximum PGA and PGV values

Eq loc	year	Ma gn.	Imax	Acc.St ation	PGA (g)	PGV (cm/s)
Friuli	1976	6.5	X	Tolm.	0.33	33
Irpinia	1980	6.8	IX-X	Sturno	0.32	54
Marche	1997	5.9	VIII-IX	Noc.U	0.50	29



seismic hazard
 PGA with a 10% chance of exceedance in 50 years

- 0.025
- 0.025-0.05
- 0.050-0.075
- 0.075-0.100
- 0.100-0.125
- 0.125-0.150
- 0.150-0.175
- 0.175-0.200
- 0.200-0.225
- 0.225-0.250
- 0.250-0.275
- 0.275-0.300

• 450 digital strong motion stations



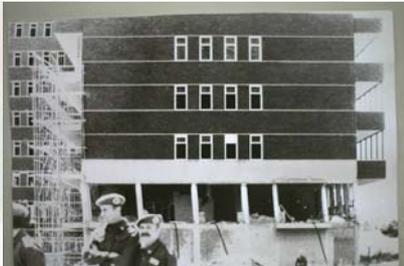
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May & sept. 1976, Ms=6.5 Friuli earthquake: 6900 dead, the almost completed new hospital of Gemona is badly damaged and demolished.

FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 17



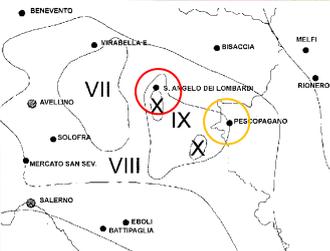
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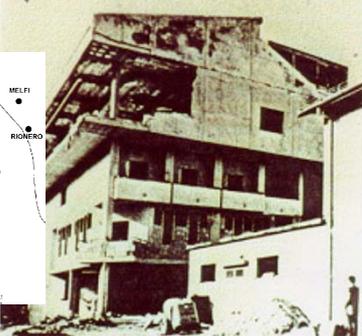
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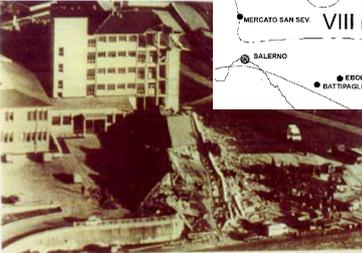
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Irpinia earthquake, nov. 1980 (M=6.8), 2500 dead

Collapse of a wing of S. Angelo dei Lombardi, new Hospital I=X (code compliant?)







Collapse of hollow clay bricks, hospital of Pescopagano, (I=IX)

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IRPINIA, 1980 : ANPA 1993 survey on hospitals



IRPINIA	S	Age of seismic classification	ANPA code	Institute code (SCPS 1992)	Building	Name	Constr. age	Total Rest. age	Partial Rest. age	Preservation Structural type	n. of floors	Height (m)	Total volume (m3)	MCS Intensity	pga	Vertical struc.	Horizontal struc.	Roof	Stairs	Ext. walls	Partitions	Foundations	
Bisaccia (AV)	9	07/03/81	?	150141	1		1974	0	0	1 rc	6	24	29376	7	0.09	0	0	1	1	1	1	0	
S.A. Lombardi	9	25/03/35	A	150183	1	destroyed	1975	0	0	rc	6	24	15120	10	0.3	7	7	7	7	7	7	7	
					2	demolished	1975	0	0	rc	6	24	10080	10	0.3	5	2	2	6	6	6		
					3	demolished	1975	0	0	rc	6	24	8880	10	0.3								
					4	demolished	1975	0	0	rc	2	7	8750	10	0.3								
S. Severino (SA)	6	03/06/81	A	150183	37	rebuilt in 1985	1800	1989	0	2 m	4	18	5687	7	0.14	4	6	6	6				
					26	medic.	1950	0	1981	2	rc	3	10	7695	7	0.14	2	2	2	1	5	5	
					54	hemod.	1950	0	1968	3	m	4	13	4936	7	0.14	3	3	1	5			5
					43	urology	1950	0	1987	2	mix	2	8	5775	7	0.14	2	2	2	1	5	5	0
					0	warehouse	1950	0	0	3	m	1	5	1680	7	0.14	3		5				
					0	reception	1950	1970	0	m	1	3	336	7	0.14	2		2					
					0	Pumps&incin.	1950	0	0	m	1	4	472	7	0.14	2							
					0	Emer. gener.	1950	0	1970	m	1	3	639	7	0.14	2							
Pescopagano	9	07/03/81	A	170007	1		1952	0	1981	rc	2	7	700	9		1	0	1	1	3	3	0	
					2		1952	0	1981	rc	2	7	280	9		1	0	1	1	3	3	0	
					3		1952	1976	1981	rc	4	12	1440	9		3	1	1		3	3		
					4	demolished	1952	0	0	rc	4	12	6000	9		5	2	2	5	5	5		
					5		1952	0	1981	rc	3	10	3000	9		5	2	2	5	5	5		
					6	emergency	1980	0	1981	rc	3	10	1000	9		4	1	1		6			
					7	patient pool	1960	1974	1981	rc	6	19	28500	9									
					8		1974	1981	0	rc	2	6	540	9									
					9	gymnasium	1974	0	1981	rc	2	6	540	9									

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Damages to hospital equipment: 1976 & 1980

Hospitals	MCS I	elevators	electric	water	heat	fire	telecom.	med. gas
S. Angelo d Lombardi	IX-X	2	2	2	2	2	2	2
Bisaccia	VII	0	2	2	2	3	2	0
Pescopagano	IX	3	2	2	2	1	2	0
S. Severino	VII	1	2	1	1	3	1	0
Gemona	X	n.a.	2	2	2	n.a.	2	n.a.
Tolmezzo	VIII	n.a.	2	2	2	n.a.	n.a.	n.a.
S. Daniele	VIII	2	2	2	2	n.a.	n.a.	2
Cividale	VII	0	2	2	0	n.a.	0	0
Spilimbergo	VII-VIII	0	2	0	2	n.a.	2	0
Maniago	VII	0	2	1	2	0	n.a.	0

→ Irpinia 1980
→ Friuli 1976

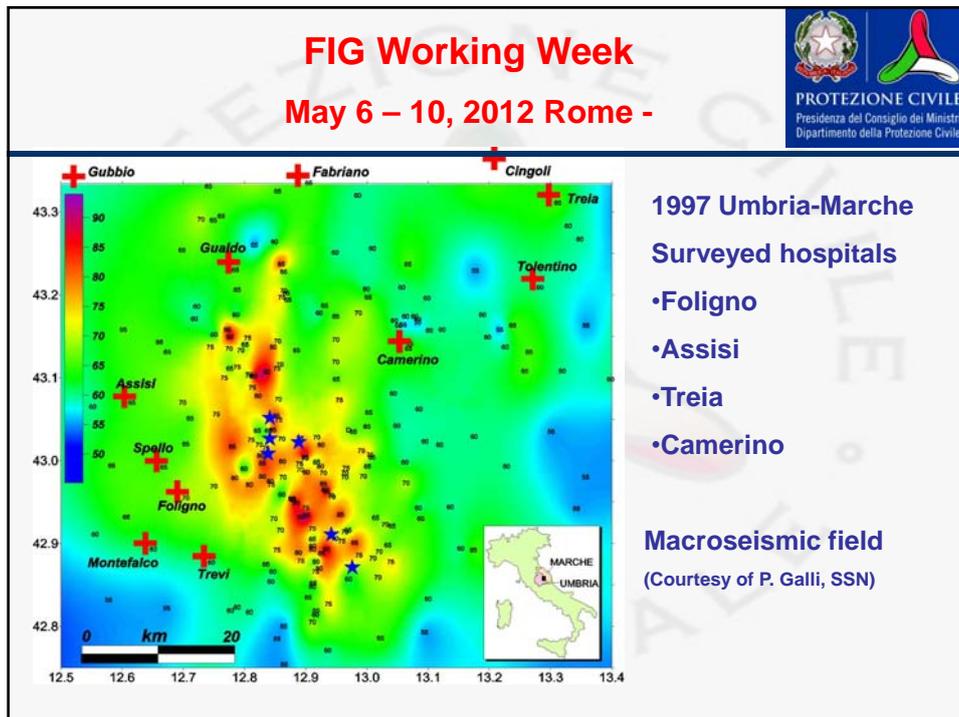


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- **L'Aquila april,6 post - earthquake experience**




L'Aquila earthquake was a very important test of the resilience of the National Civil Protection Service . The magnitude of the earthquake was $M_I = 5,8$, the ipocenter was at 4.9 km and practically under the urban centre of L'Aquila.

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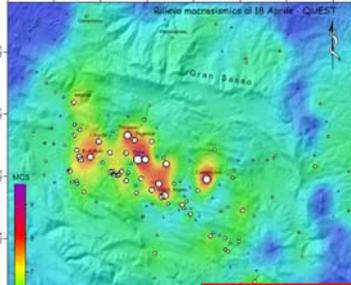
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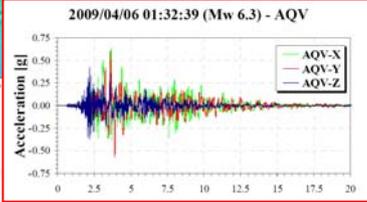


Quest
Macroseismic
field (2 weeks)

RAN record of
the quake (1-2
hours)



INGV record of the quake
(5 minutes)



2009/04/06 01:32:39 (Mw 6.3) - AQV

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PRESIDENZA DEL CONSIGLIO DEI MINISTRI
Dipartimento della protezione civile
Ufficio rischio sismico

RAPPORTO E.S.

Rapporto Emergenza Sismica

3

SCENARIO (SIGE)

Evento sismico

Comune epicentrale: L'Aquila (L'Aquila)

Data: 06-04-09 Longitudine: 13.33 Profondità: 4.9

Ora: 03.32 Latitudine: 42.33 Magnitudo MI: 5.8

Stime complessive (Attenzione: scenario calcolato su una profondità media ipocentrale di 10 km)

Probabili persone coinvolte in crolli (min-max)	200	2200
Probabili persone senza tetto (min-max)	8700	54000
Probabili abitazioni crollate o inagibili (min-max)	6700	38000
Probabili abitazioni danneggiate (min-max)	61000	207000
Probabile intensità (MCS) massima raggiunta	VII-IX	

Definizioni della scala di emergenza sismica

Effetti	Azioni	Soggetti
0 Non rilevanti	Contatti telematici	(INGV-DPC)
1 Probabili danni ai manufatti	Sopralluoghi	Autorità locali. Eventuale supporto DPC.
2 Danni ai manufatti. Limitato numero senza tetto.	Sopralluoghi. Verifica condizioni organizzative. Eventuali alloggi alternativi.	Autorità locali. Supporto DPC.
3 Danni estesi. Probabili coinvolti in crolli (pochi). Elevato numero senza tetto.	Coordonamento generale. COM. Rilevamento danni. Alloggi provvisori.	DPC, EUCENTRE, RELUIS, Volontariato.
4 Danni gravi e crollati. Coinvolti in crolli (molto).	Squadre SAR. Ospedali. Rilevamento danni. Alloggi provvisori.	DPC (Tutti i soggetti)
5 Devastazione su grande scala.	SAR. Ospedali. Rilevamenti. Alloggi provvisori. Aiuti internazionali.	Anche soggetti esterni (UE)

People in collapsed buildings: 200-2200
Homeless: 8700-54000
Collapsed /unusable dwellings : 6700-38000
→ collapsed/unusable buildings: 4000-24000



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6 April, 2009 – Rome CPD - Coordination

- 4.15: Crisis unit at Rome – Civil Protection Department
- 4.40: DPC team start reaching L'Aquila
- 4.40: Civil Protection Operative Committee
- 9:00: Organization of the Command and Control Direction (Di.coma.C.), in L'Aquila - GdF Compound



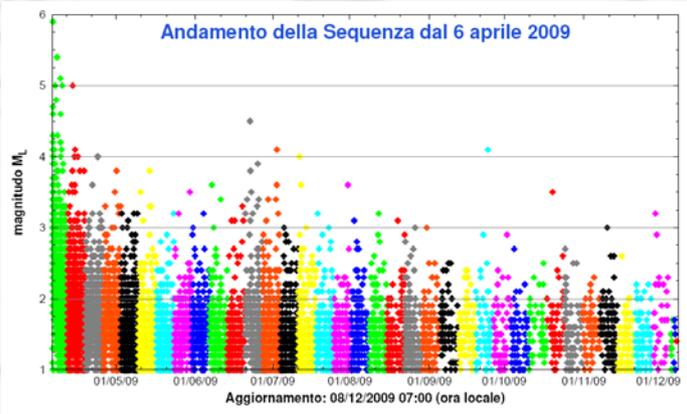

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Andamento della Sequenza dal 6 aprile 2009



Aggiornamento: 08/12/2009 07:00 (ora locale)



Istituto Nazionale di Geofisica e Vulcanologia



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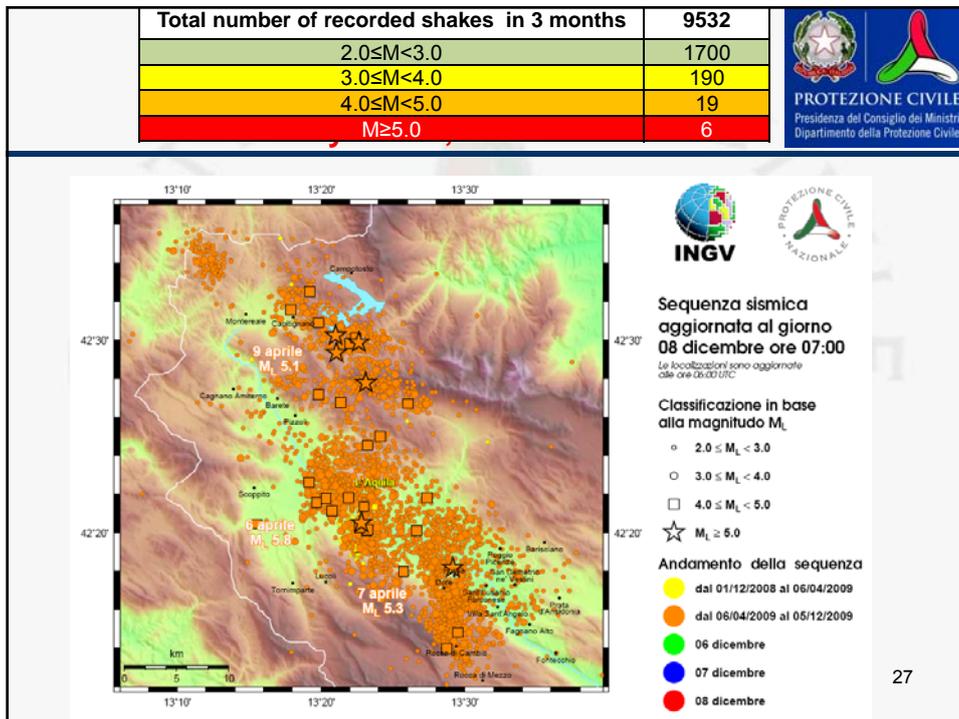


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ONNA

FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes.

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Holy Souls Church in L'Aquila

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Search and Rescue teams from fire brigade started immediately after the quake, also with the support of dogs. More than 100 lives were saved.

	24 hours	48 hours
 Fire Brigade	2010	2400
Army Forces	1520	1650
Police	1500	2000
Red Cross	800	800
Volunteers	2000	4300

The assistance to the population was activated since the first moments, in parallel to the search and rescue operations. It was necessary to provide shelter for homeless people, that was estimated of the order of some tenths of thousands since the beginning. The figures drawn from the simulation scenario, however, were further increased by the ordinance of evacuation for all the citizens, promulgated by the mayor of L'Aquila, soon after the quake. Therefore, even people living in **undamaged** houses needed a **shelter**.



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S. Salvatore Hospital



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Di.COMA.C.

- initially based in the sport palace of **GdF** (Army corp of Ministry of Economy) compound.
- Placed in the Commercial building up to 2011.
- Functions established by decrees of the Head of Department and Delegate Commissary:
 - n. 1 (april 9) institution of Mixed Operative Centres,
 - n. 2 (april, 10) institution of Di.COMA.C. and relevant functions:
 - F1** Technical and damage survey; **F2** Health, **F3** Volunteers and local Administrations; **F4** Operative structures and roads; **F5** materials and instruments, logistics, **F6** assistance to population, **F7** Support to Coordination of Regions, **F8** TLC, **F9**, Essential services, **F10** information and mass media, **F11** Cultural heritage , **F12** Administration.

Personnel from the National System: e.g. Fire Brigade , Regions, Red Cross, Province, Mucipalities, Gas, Electricity water, telephone companies, etc.

FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 34

FIG Working Week

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Presidenza del Consiglio dei Ministri
Commissario delegato ai sensi del DPCM del 6 aprile 2009
Decreto n.1 del 9 aprile 2009 "Istituzione di Centri Operativi Misti (COM)
con i relativi comuni afferenti" e successive integrazioni
(Decreto n.4 del 17 aprile 2009 e Decreto n.8 del 29 maggio 2009)

Operative Mixed Centres (COM)

Legenda

Sedi dei COM

- COM 1 - Scuola materna Via Scarfoli
- COM 2 - Scuola elementare San Demetrio
- COM 3 - Scuola elementare
- COM 4 - Centro sportivo
- COM 5 - Campo sportivo
- COM 6 - Istituto Comprensivo Scolastico
- COM 7 - Edificio Trasporti Comune
- COM 8 - Sede Vigili Urbani
- Di COMA C

Centri Operativi Misti (COM)

- COM 1 - L'Aquila
- COM 2 - San Demetrio
- COM 3 - Pizzoli
- COM 4 - Pianola
- COM 5 - Paganica
- COM 6 - Navelli
- COM 7 - Sulmona
- COM 8 - Montorio Al Vomano

Le frazioni indicate nel Decreto n.1 del 9 aprile 2009 sono state cartografate mediante la rappresentazione delle corrispondenti località ISTAT 2001. I limiti dei COM 1 - L'Aquila, COM 5 - Navelli e COM 2 - Pianola, sono interpretati mediante delle linee colorate per ricomprendere le frazioni e le località all'interno della località ISTAT 2001 "L'Aquila".
La cartografia utilizzata come sfondo è World Street Map di ArcGIS online di ESRI

FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 35

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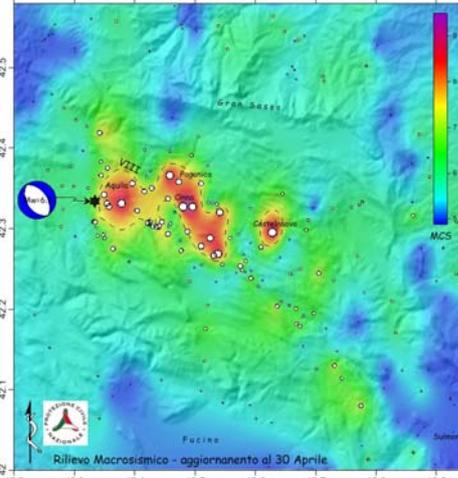


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TECHNICAL ACTIVITIES

- 1) **Building damage recognition:** a) quick definition of red zones, b) GIS of buildings, c) instruction of survey teams to **AeDES** form, d) survey team management, e) coordination with 8 **COMs**, f) IT, g) check of addresses, g) specific survey in schools, Technicians from **Regions**, **competence centres** and all the **National Orders of professionals**. (about 8.000 technicians).
- 1) **Macroseismic survey** : perimeter of the most damaged area (CPD + INGV)

FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes,



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Population assisted in temporary housing: tents and hotels

Cost of assistance : 456 M€

	prime 48 h	valore massimo raggiunto	Il dato al 29 gennaio
Popolazione assistita	27.772 Tendopoli → 17.772 Hotel → 10.000	67.459 Tendopoli → 35.690 Hotel → 31.769	10.028 Tendopoli → 0 Alberghi/caserma → 7.652 Case private → 2.376
Aree di ricovero	30	171	0
Tende	2.962	5.957	0
Cucine da campo	10	107	0
PMA – presidi sanitari	13	47	0

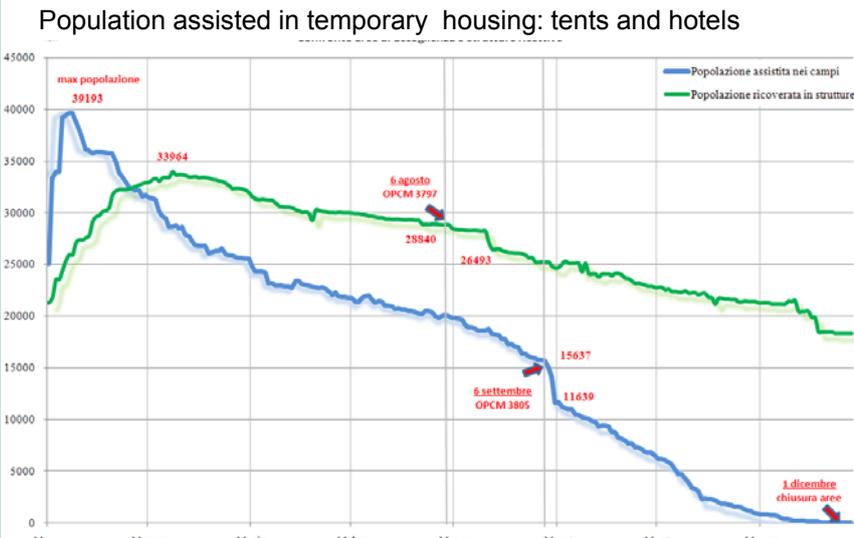
FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 37

FIG Working Week May 6 – 10, 2012 Rome -



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Population assisted in temporary housing: tents and hotels



Date	OPCM	Population in Tents (Blue)	Population in Structures (Green)
11-apr		39,193 (max)	~22,000
11-mag		~30,000	33,964
6 agosto	OPCM 3797	~28,000	28,840
6 settembre	OPCM 3805	11,639	~25,000
1 dicembre	chiusura aree	0	~18,000

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Temporary long-term housing C.A.S.E Project



Solution 1

Complessi Antisismici **Sostenibili** ed Ecocompatibili: 18 sites 183 buildings

3600 dwellings 19.000 citizens



FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes.

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Seismic safety of CASE

PROTOTIPO ISOLATO:

- Sottostruttura di fondazione.
- Dispositivi di isolamento caratterizzati da una elevata deformabilità.
- Sovrastruttura che trasmette i carichi verticali alle fondazioni e risulta libera di muoversi nel piano.

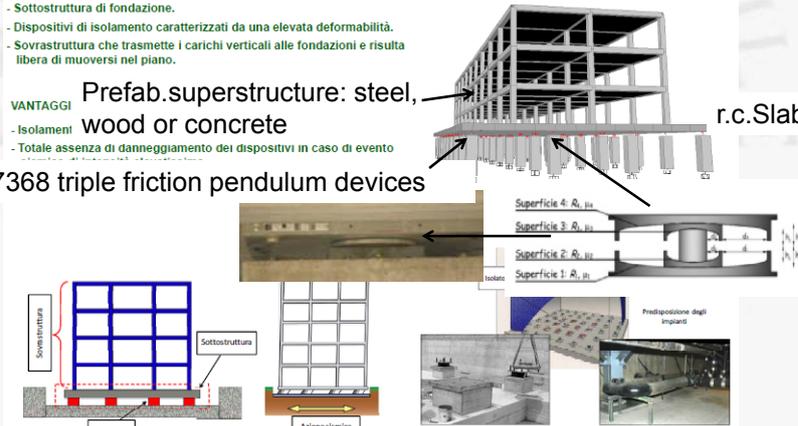
VANTAGGI

- Isolamenti
- Totale assenza di danneggiamento dei dispositivi in caso di evento

Prefab.superstructure: steel, wood or concrete

7368 triple friction pendulum devices

r.c.Slab



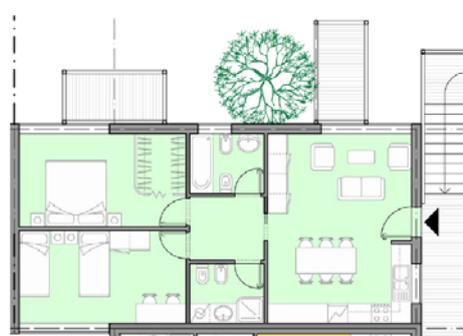
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Population assisted in CASE : a sample dwelling



TRILOCALE TIPO A - SCALA 1:50
FIG working week 2012; Giacomo Di Pasquale; Administration of Lanos after Earthquakes.

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Durable housing (wood)
 1 floor MAP Modulo
 Abitativo Provvisorio





FIG Working Week 2012; Giacomo Di Pasquale 43

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2 floor MAP
 Wooden frame with wood panels
 blocked by screws
 Sandwich panels with internal frame in
 massive wood and glued on both
 faces:
 Less land occupation and more ductility





FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes. 44

<p style="text-align: center;">FIG Working Week May 6 – 10, 2012 Rome -</p> 						
Project	Period	N. cantieri	Workers: mean nr./hour	Total hours worked	Total accident	Accident N. per Million hour worked
C.A.S.E. (up to 3 turns/d)	June '09 - March '10	19	4.000	19.584.000	18	0,92
M.U.S.P. (up to 2 turns/d)	August '09 – Febr. '10	33	825	1.584.000	1	0,63
M.A.P. outs. L'Aquila (up to 2 turns/d)	August '09 - March '10	121	1.452	4.181.760	2	0,48
M.A.P. L'Aquila (up to 2 turns/d)	August '09 - March '10	19	400	809.600	1	1,24
TOTAL WORKS	JUNE '09 - March '10	194	6.802	26.284.960	22	0,84
National Values 2008	January 08 - December '08		1.970.000	3.467.200.000	79.841	23,03

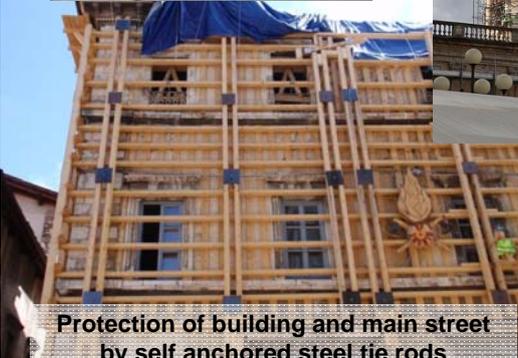
<p style="text-align: center;">FIG Working Week May 6 – 10, 2012 Rome -</p> 	
 <p>Protection of main street by confinement of columns</p>	<p style="text-align: center;">Protection of holy souls church by SAF technology (Speleologico, Alpino, Fluviale)</p> 
 <p>Protection of building and main street by self anchored steel tie rods</p>	<p style="text-align: center;">Fire Brigade provisional intervention</p> 
<small>Master II Livello in Ingegneria dell'Emergenza. Roma 12 maggio 2010 - Mauro Dolce, Giacomo Di Pasquale</small>	

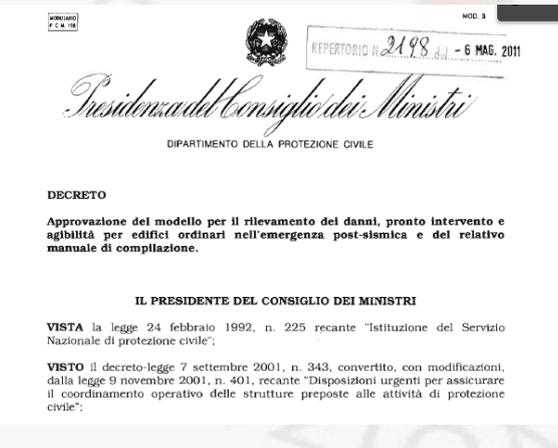
FIG Working Week

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Usability classification of the damaged buildings



DECRETO

Approvazione del modello per il rilevamento dei danni, pronto intervento e agibilità per edifici ordinari nell'emergenza post-sismica e del relativo manuale di compilazione.

IL PRESIDENTE DEL CONSIGLIO DEI MINISTRI

VISTA la legge 24 febbraio 1992, n. 225 recante "Istituzione del Servizio Nazionale di protezione civile";

VISTO il decreto-legge 7 settembre 2001, n. 343, convertito, con modificazioni, dalla legge 9 novembre 2001, n. 401, recante "Disposizioni urgenti per assicurare il coordinamento operativo delle strutture preposte alle attività di protezione civile";



FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 47

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Usability classification of the damaged buildings

A) USABLE BUILDING	The building can be used in all its parts . Light damages, if any, cause negligible risk.
B) TEMPORARILY UNUSABLE BUT USABLE with short term countermeasures	The building is unusable but it becomes usable after short term countermeasures reducing the risk at acceptable levels.
C) PARTIALLY unusable	The building is partially unusable in some parts to be specified, while other parts can be used
D) TEMPORARILY UNUSABLE requires more investigation	The building need a further investigation and remains unusable until a new survey.
E) UNUSABLE	The building is unusable due to structural, non structural or geotechnical risk. This does not implies an imminent risk of complete collapse.
F) UNUSABLE DUE TO EXTERNAL RISK	The damage level of the building itself could be considered at low structural risk, but it is subjected to risk generated by other buildings or constructions

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Usability Survey Planning (safe areas)



FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 49

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Planning of **usability survey** starting from safer zones

Historical centre inspected subsequently

Internet , radio and newspaper for periodical informations on areas to be inspected

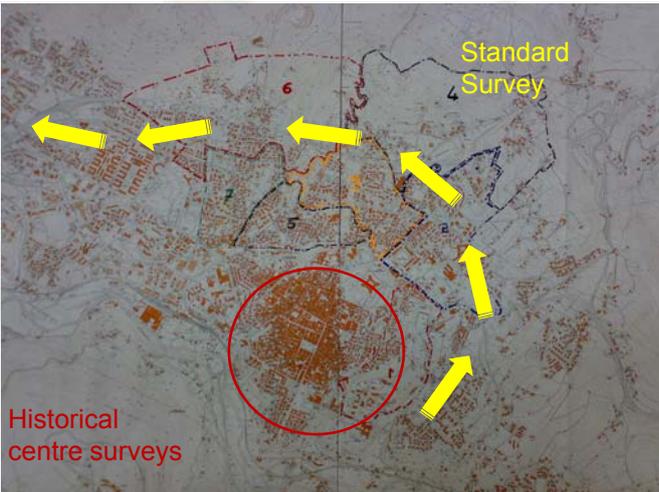


FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 50



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Red Zones

Attention to risk.

Support of Fire Brigade supporto

Control of access by Army and Police

Usability Survey – Maps of red zones and of parts of the hystorical centre to be surveyed

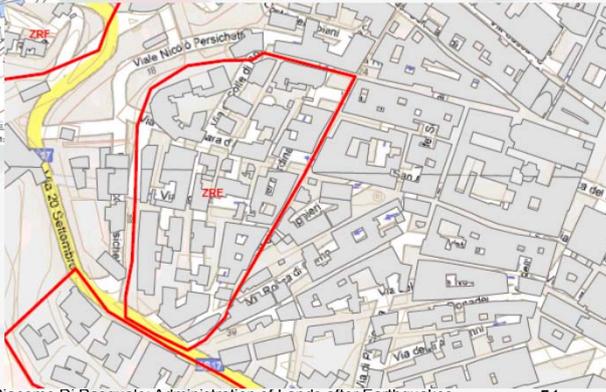


FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 51



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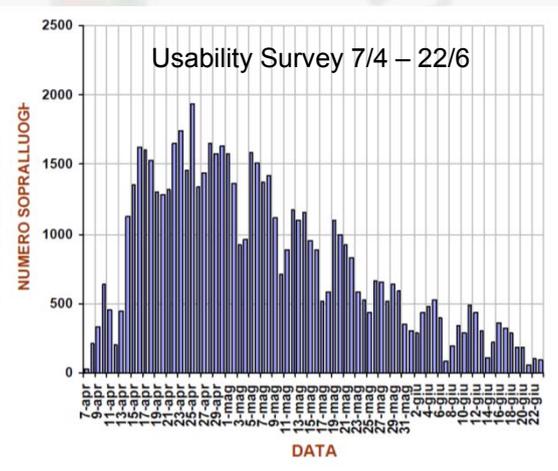
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The **usability survey** was a central activity for the reconstruction:
 In the first days public Technicians from Regions.

CPD invited the technicians of the National Professional Orders: Architects, Engineers, Surveyors, and Geologists

Up to **1800** surveys/day
 About **8.000** technicians



Usability Survey 7/4 – 22/6

NUMERO SOPRALLUOGI

DATA

FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 52

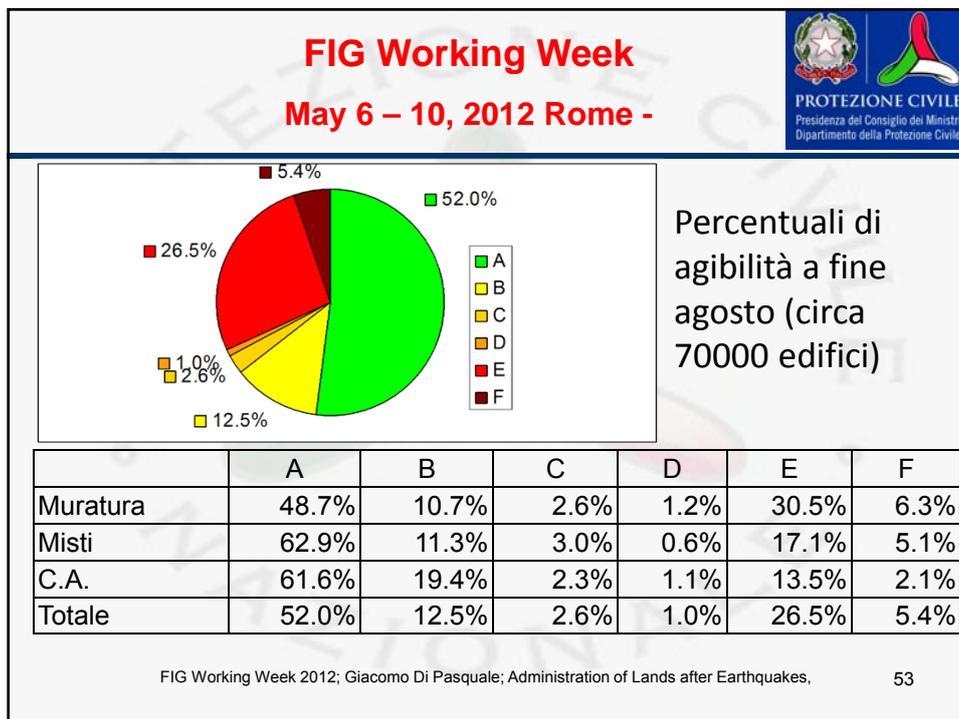


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Reconstruction of private buildings

OPCM **3778** private buildings slightly damaged type **A** (limited structural damage) : maximum State contribution: **up to 10.000€** to repair the dwelling and , in case of multiple dwelling building, **2500€** to repair common parts:

OPCM **3779** private buildings moderately damaged, type **B** or **C** quickly repairable : repair + local strenghtening

OPCM **3790** private buildings severely damaged, type **E** repair+ seismic upgrade with safety level from 60% to 80% of a seismically adequate structure (the owner can reach the complete adequacy with its own funds).

demolition and rebuilding or also new location is allowed for E type damage if the cost of repair+ seismic upgrade is allowed if the the cost of intervention is higher than the cost of production of a social residential housing

The check can be simplified considering unit reference costs of 400 or 600 €/mq Of surface according to the damage level

FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 54

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GUIDELINES FOR THE RECONSTRUCTION

Guidelines for repairing and strenghtening structural elements, external and internal walls (CPD, ReLUIS).

Guidelines for reducing the vulnerability of non structural element, furnitures and plants (CPD).

Guidelines for investigations on structures and soils and for designing interventions of repair / upgrade / rebuilt of unusable buildings (CPD, STM Abruzzo, ReLUIS, ALIG, ALGI)

Guidelines for the analysis and design of interventions of local repair / upgrade / rebuilt on buildings in masonry aggregates.


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FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 55

FIG Working Week
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Reconstruction at April 2012

Recostruction project of **private buildings** were controlled by a new structure with qualified personnel in the field of administrative (FINTECNA), structural (ReLUIS) and cost anaysis (CINEAS) aspects.

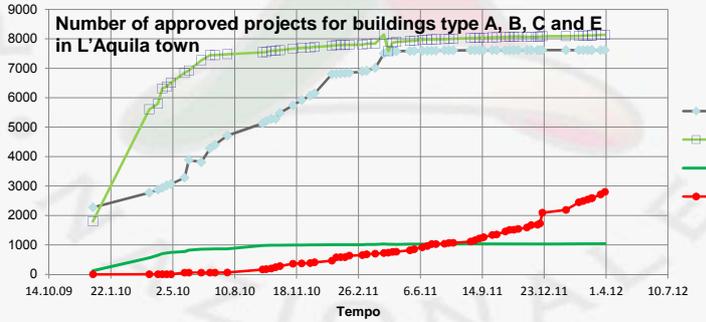
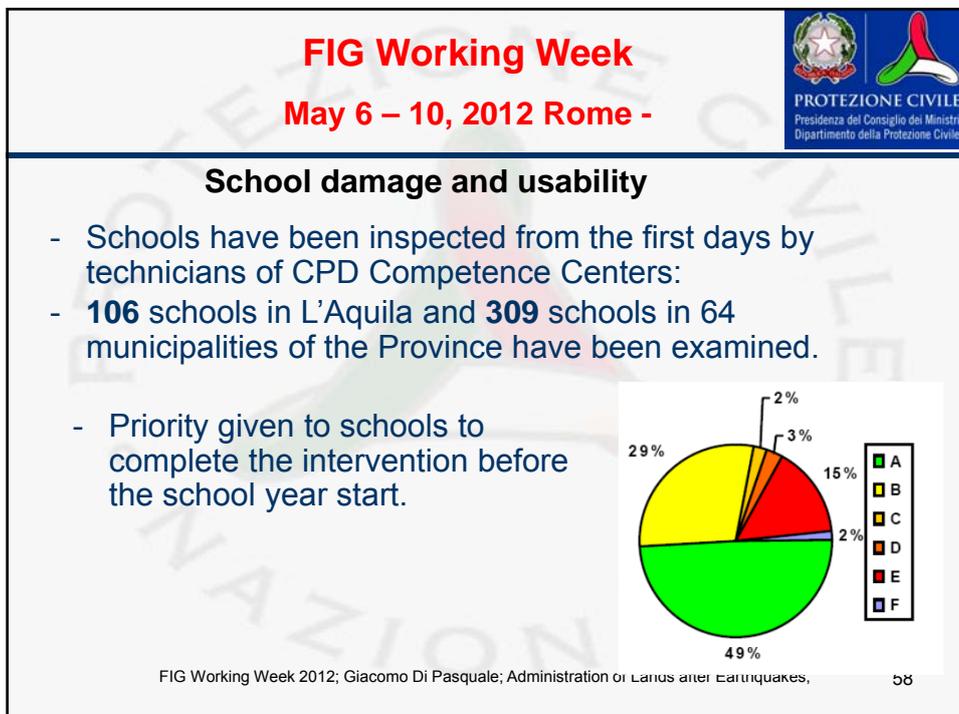
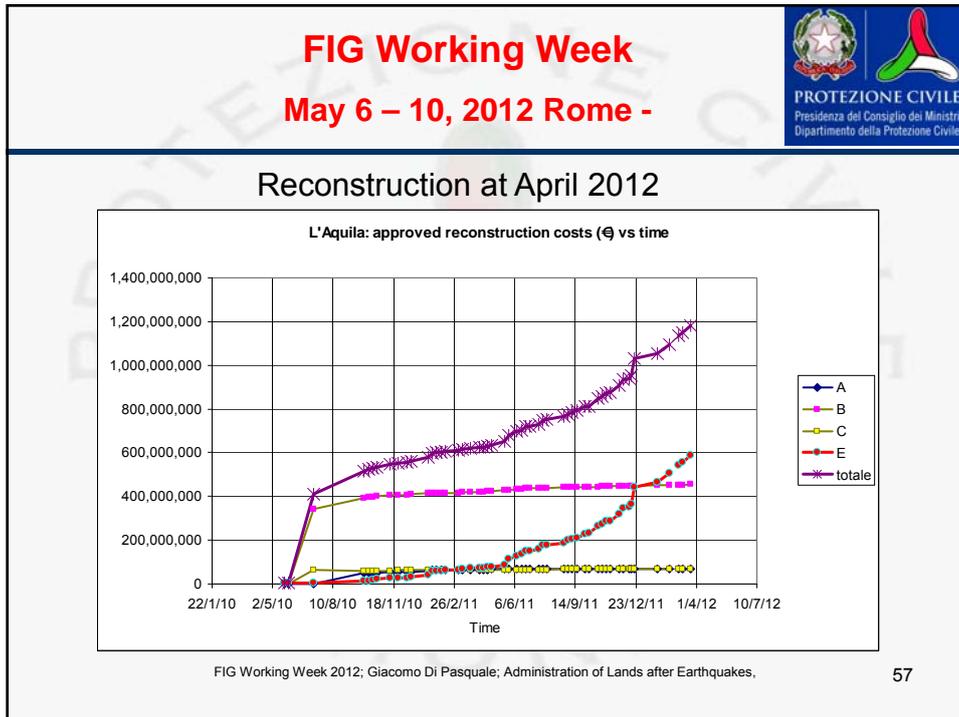


FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 56





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School safety program

The program started on may 2009 and was completed in september, just in time for the new year

- **Repair & strengthening of 35 school buildings with minor damages (A, B) able to host 7 000 studentis in L'Aquila and other 24 schools outside l'Aquila (31 M€)**
- **32 Modules for schools (MUSP) able to host 6 000 studentis+ new Conservatory A. Casella → (81 M€)**

FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 59



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Local intervention with carbon fibers



Reinforcing and stabilization of internal and external walls

FIG Working Week 2012; Giacomo Di Pasquale; Ac

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Dante Alighieri school
after repair and local
intervention



FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 61

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May 6 – 10, 2012 Rome -



MUSP in L'AQUILA



08/09/2009 13:49

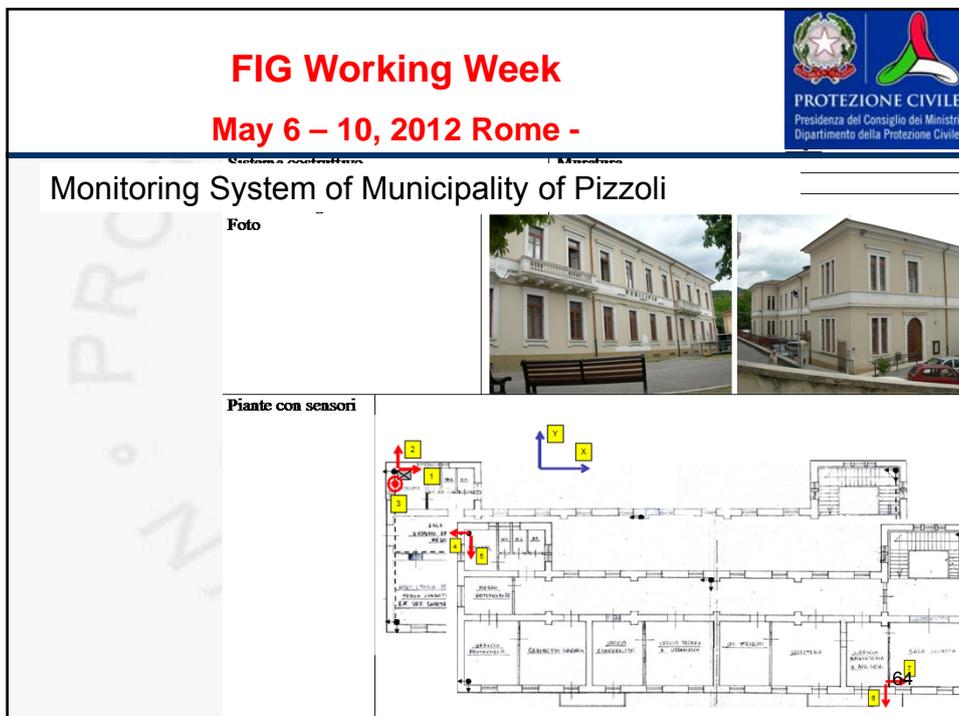
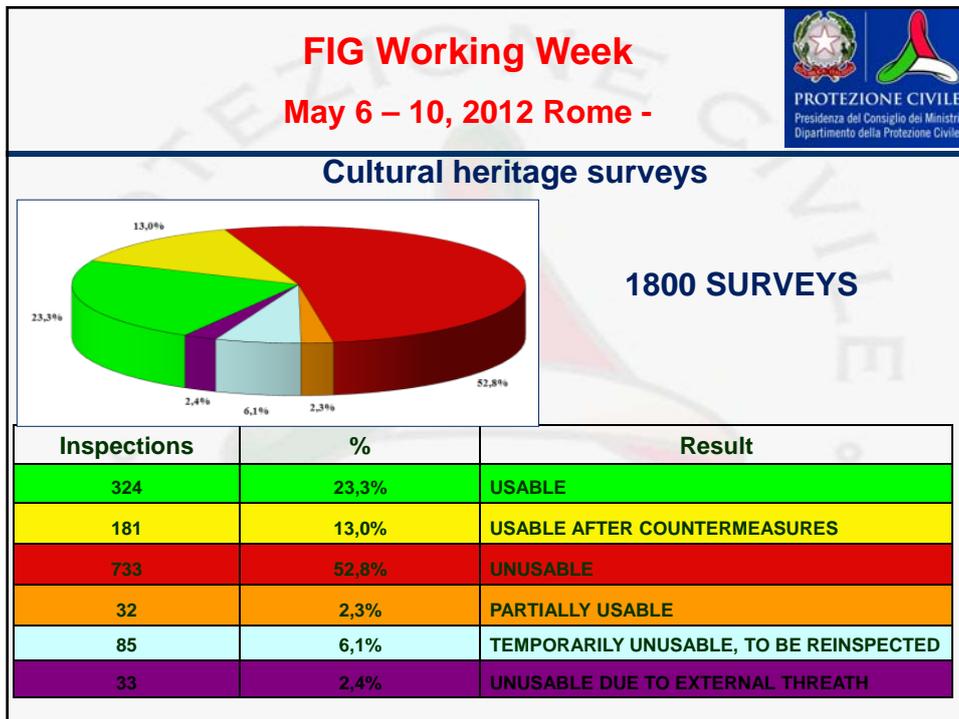


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Seismic prevention

The first prevention is the seismic code: knowledge of the demand posed by the earthquakes is the first information to be considered. Unfortunately for a long time the seismic code simply followed earthquakes. After the 1908 earthquake of Messina and Reggio Calabria (more than **80.000 dead**) the entire Calabria region and a part of eastern Sicily were considered seismic. In the subsequent period the seismic zonation was revised, up to 1980 Geodynamics Finalized

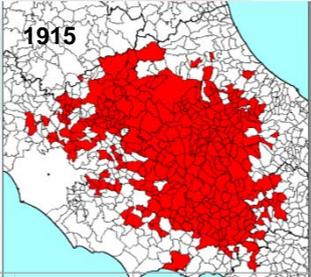
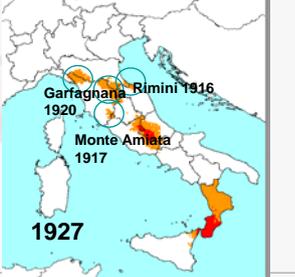
 1908	 1915	 1927
Seismic classification after 1908 eq; Reggio Cal. And Messina (R.D. 193/1909)	Seismic classification after 1915 earthquake (R.D. 573/1915)	Seismic classification after 1927 earthquakes. (R.D. 431/1927) 65

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- **Seismic prevention** aims to reduce damage and losses in future earthquakes.
- prevention is strongly perceived as a priority immediately after an earthquake, but the memory of the damages and dead vanishes along the time and returns only when a new earthquake happens.
- After 2002 earthquake in Molise and Puglia, where a school collapsed causing the death of 27 school mates and two teachers (the locality were considered not seismic at that time). CPD proposed the **ordinance n. 3274/2003**, signed by the President of Ministers Council, that changed a) the Italian seismic classification considering also the results of a seismic hazard analysis carried out in 2001 by CPD; b) the seismic code that was inspired by Eurocodes, and c) the same Ordinance enforced the **seismic check of all buildings** and infrastructures considered strategic for the emergency management (hospitals, Fire Brigade Barracks, Command Centres... or relevant in case of collapse (schools, theatres, crowded offices open to the public... CPD has continued to support the development of the **new seismic code (NTC08)**, issued on January 14 2008 by Minister of Infrastructures and Transport together with Minister of Interior and CPD. 66

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Technical activities: Seismic microzonation of L'Aquila Territory

- The reconstruction activities are more effective if the seismic hazard takes into account the modification due to **seismic local response** and dependent from subsoil characteristics and morphology.
- CPD coordinated a group of 160 researchers and experts to study the microzonation of the areas having $MCS \geq 7$, following the Guidelines for seismic microzonation.
- Seismic microzonation has been financed, together with other interventions on public and private buildings and infrastructures, with **article 11 of Law 77/2009** (Law for Abruzzi Earthquake). In particular Ordinance n. 3907/2010 established how to use 44 million euro available for year 2010 and Ordinance n. 4007/2011 the use of 145 million euro available for year 2011.

FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes,

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SEISMIC MICROZONATION OF L'AQUILA AND LOCALITIES





© 2009 Cinea Spot Image
Image © 2008 DigitalGlobe
77665.99 m E 4683060.87 m N

© 2008 Google
77.54 km Alt



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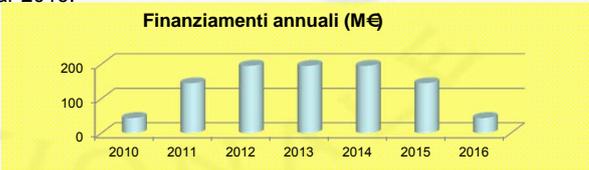
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Law 77/2009, article 11: Measures for seismic risk prevention

1. A Fund for the seismic risk prevention is instituted within the state of prevision of the Ministry of Finance.
2. To this scope it is authorized the expense of:
 - 42.504 million euro (44 initially) for the year 2010.
 - 145.1 million euro for the year 2011.
 - 195.6 million euro for each of the years 2012, 2013 and 2014.
 - 145.1 million euro for the year 2015
 - 44 million euro for the year 2016:

Total: 963.504 M€



Anno	Finanziamento (M€)
2010	42.504
2011	145.1
2012	195.6
2013	195.6
2014	195.6
2015	145.1
2016	44

FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 69



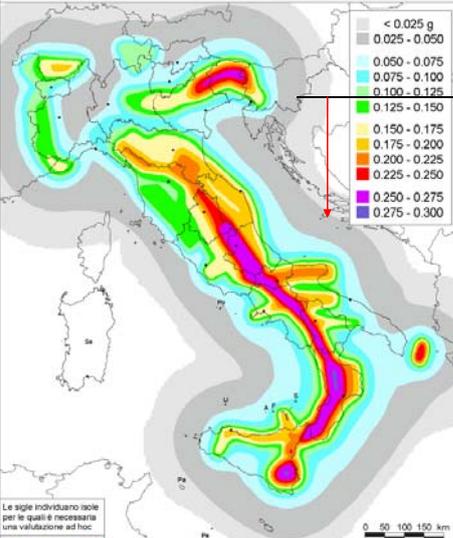
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The Funds cannot be used for buildings or other structures located in municipalities in which the horizontal peak ground acceleration on stiff soil “**ag**” is lower than **0.125g** (v. annex 7).

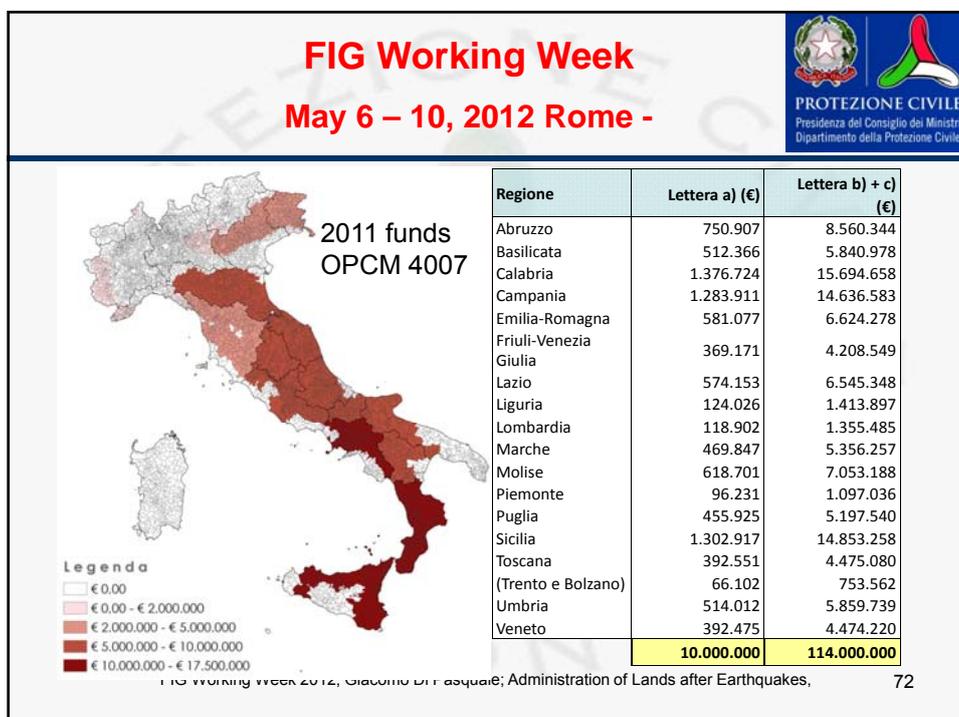
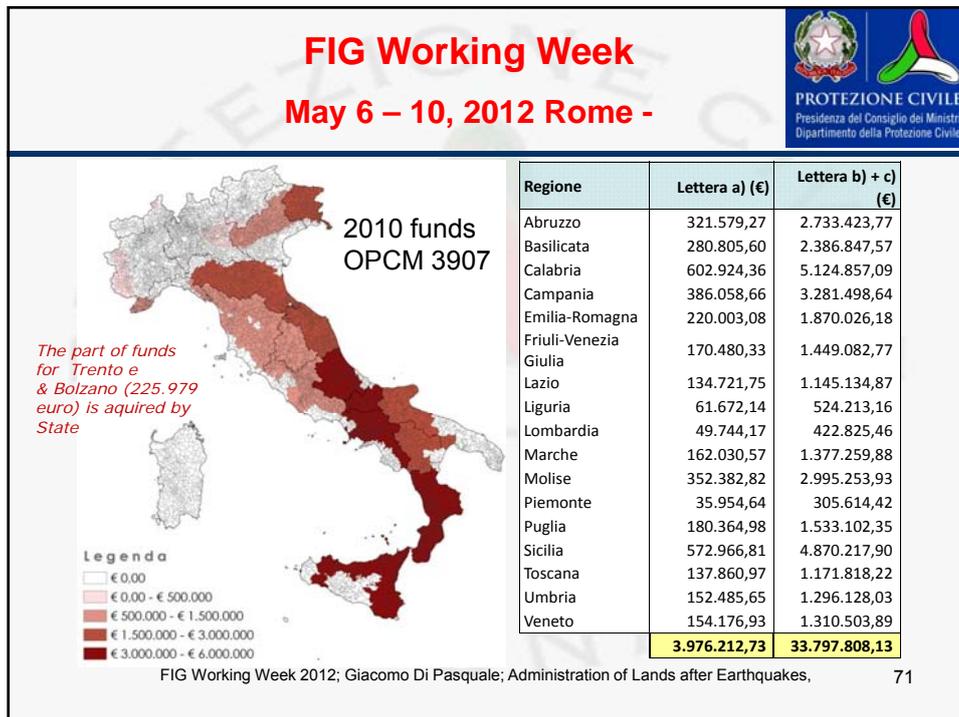
The distribution of the funds among Regions is determined by the risk for human life, as determined by studies carried out by CPD and Competence Centres.



Le sigle individuano isole per le quali è necessaria una valutazione ad hoc.
 Elaborazione: aprile 2011

0 50 100 150 km
 I U

FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 70





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FIG Working Week

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- *News for OPCM 4007/2011*
- *Funding of private buildings is mandatory (was optional in OPCM 3907) in the range 20-40% of the total budget*
- *Actions for microzonation are oriented to Civil Protection objectives (optional) through the Analysis of the Limit Condition of the urban center (CLE)*
- *The risk index has been updated according to the new estimate of seismic risk for human life and new weights of social and individual risks*

FIG Working Week 2012; Giacomo Di Pasquale; Administration of Lands after Earthquakes, 73



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Thanks for the attention
Any question?