



**“NATIONAL SURVEY FOR SEISMIC PROTECTION”**  
**MINISTRY OF EMERGENCY SITUATIONS OF REPUBLIC OF ARMENIA**

# **THE LESSONS OF THE SPITAK EARTHQUAKE**

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# General information Republic of Armenia



<b>Head of the State</b>	President
<b>Official language</b>	Armenian
<b>Capital</b>	Yerevan
<b>Administrative and territorial unit</b>	Marz (11 Marzes in all including Yerevan)
<b>National currency</b>	Dram (international currency code - AMD)
<b>Territory</b>	29.74 thousand square km
<b>Neighbouring countries</b>	north- Georgia south- Iran east- Azerbaijan west- Turkey
<b>Average elevation above sea level</b>	1800 m
<b>The highest peak</b>	Aragats mountain - 4090 m
<b>The lowest altitude</b>	Debed river canyon - 380 m
<b>Population</b>	3,018,000
<b>Average temperature</b>	in January - -6.8° C, in July - +20.8° C
<b>Time zone</b>	Greenwich mean time + 4 hours

# Devastating disaster 1988

## Natural Hazards in Armenia

Earthquakes	94%
Mudslides Landslides rockfalls Floods Irradiation	6%

## Spitak Earthquake 1988

**Time:** December 7, 1988 at 7.41.22.7 GMT (11.41.22.7 local time)

**Coordinates of epicenter:** latitude 40.92° N, longitude 44.23° E

**The depth of the hypocenter:** 10-15 km

**The magnitude of the earthquake:** 7.0

**The intensity at the epicenter:** 10 (MSK-64 intensity scale)



The earthquake hit 40 % of the territory of Armenia, densely populated region with 1 ml people. The affected area, where the intensity of the earthquake was  $\geq 8$ , involved 30002 km area.

21 towns and 342 villages were destructed

514 000 people were left without shelter

20 000 people were injured

12 500 people were hospitalized

25 000 people died

17% fund of dwellings were destroyed, the work of 170 industrial companies were halted, the great losses were caused to villages and agro industrial complexes as well as to the architectural, historical and cultural monuments, 917 public buildings were destroyed.

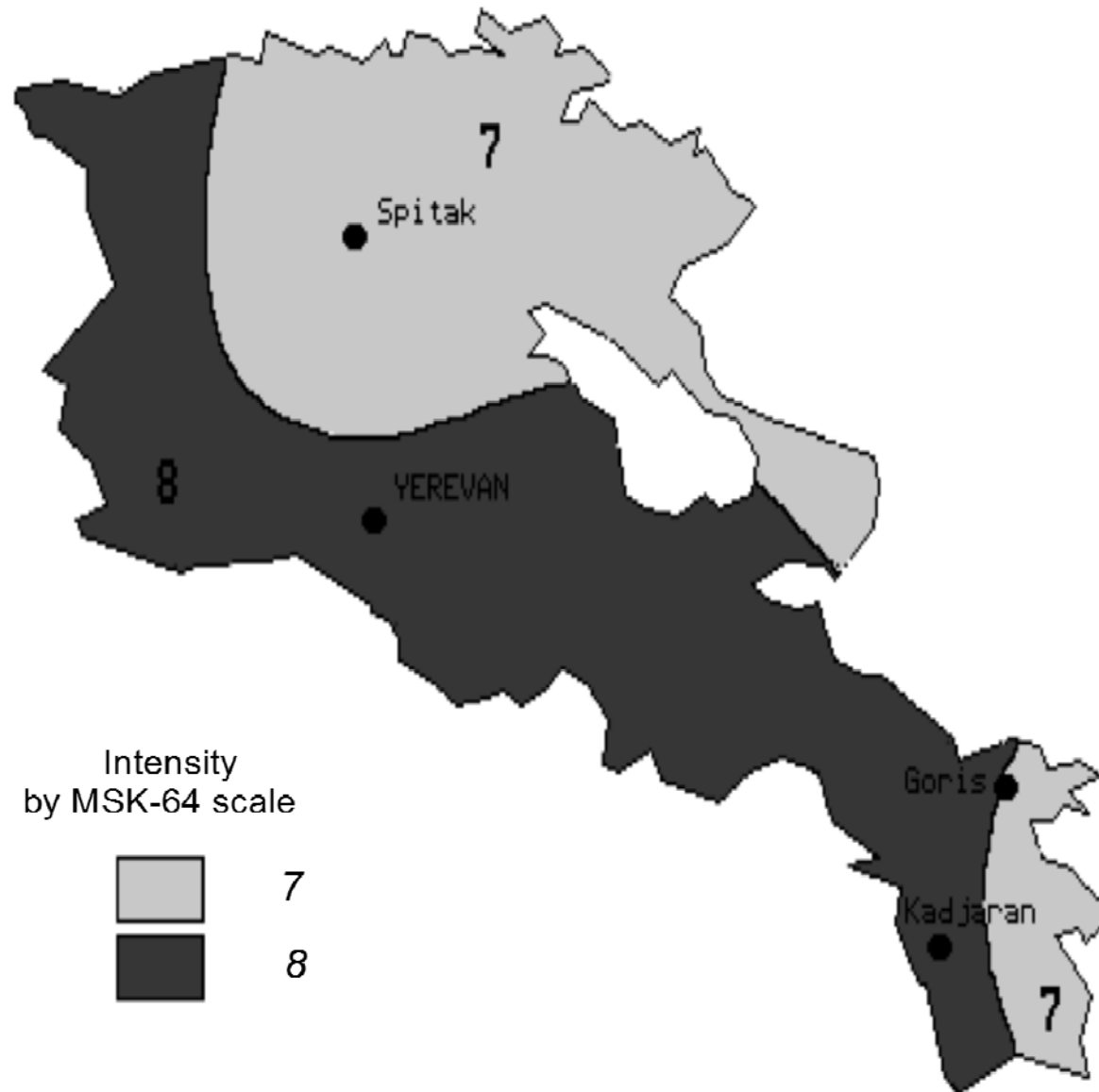
The unexpected disaster took unawares the organizations and agencies that were called to work in emergency. The rescue activities were systemized only two or three days later. From the first second the earthquake strike, the population carried out restless rescuing works. Anyhow the absence of their experience and sometimes the lack of basic knowledge on actions in emergency caused real difficulties for the efficiency of rescue operations. Even there were cases when the public unawareness brought to life losses. Also there was a need of rescue equipment.

**The main reasons of the losses are various.  
Noteworthy among them are as follows:**

1. The seismic hazard of the territory of Armenia was underestimated. The intensity of 1988 earthquake was assessed in Spitak 10, in Gyumri and Stephanavan 9 and in Vanadzor 8-9 value on MSK-64 intensity scale.
2. The quality of construction was inadequate. The construction technologies were violated and the materials didn't correspond to the standards.
3. The special governmental committee studying disaster subsequences found out that definite mistakes in construction designing were made.
4. Governmental bodies weren't able to control the situation in time and arrange the rescue works. Many structures weren't ready to resist the disaster.

There is a need to raise public awareness. It is necessary to learn from past tragedy as the made mistakes are uncountable and the persons who made those mistakes are inexcusably numerous.

## Seismic Hazard map of Armenia maid in 1978 (by Baghramyan)



## National Survey for Seismic Protection (Armenian NSSP) of the Ministry of Emergency Situations of the Republic of Armenia (MES of RA)

MINISTRY OF EMERGENCY SITUATIONS OF ARMENIA					
Rescue Service (including Crisis Management Center- the main body for planning, co-ordinating and implementing measures related to natural and other forms of disasters)	National Survey for Seismic Protection (Armenian NSSP)	Hydrometeorology and Monitoring State Service	National Technical Safety Center	Atmospheric Phenomena In Active Service Impact	State of Emergency Crisis Management Academy
"NSSP" AGENCY					
Northern Survey For Seismic Protection	Southern Survey For Seismic Protection	Western Survey For Seismic Protection	Eastern Survey For Seismic Protection		



**Armenian NSSP was founded in 1991. The main objectives and the aims are as follows:**

- Provision of seismic hazard monitoring in the territory of Armenia
- Assessment of the seismic hazard and seismic risk of the territories
- Seismic risk reduction
- Assessment of the levels of caused seismicity
- Assessment of other secondary hazards connected with the seismic hazard.



# Laws and regulations

Seismic Protection activities are regulated by a number of laws and legislative acts and national programs of the Republic of Armenia:

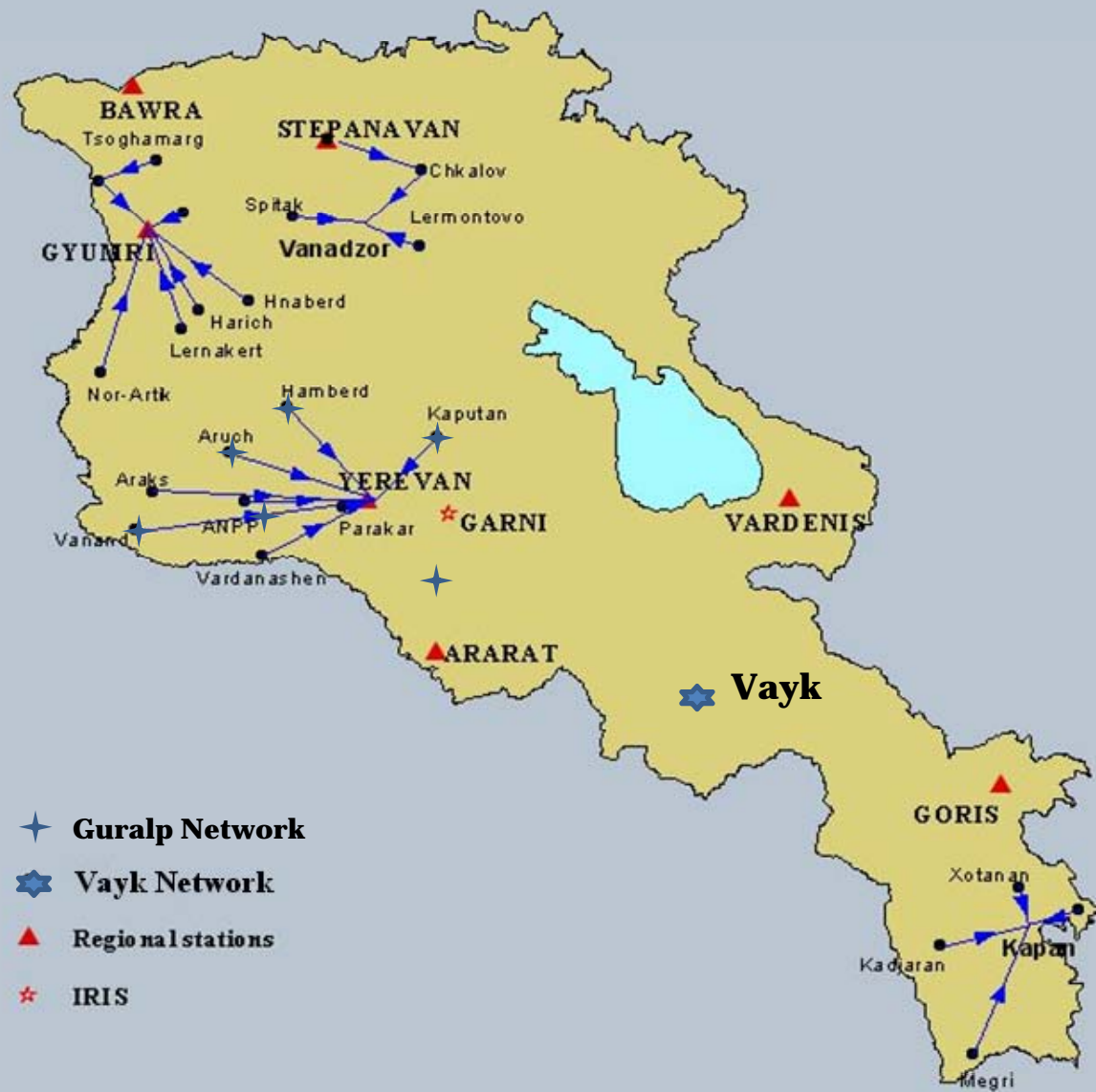
<b>Law of RA</b>	The Law of the Republic of Armenia on Seismic Protection (2002)
<b>Resolutions of Government</b>	The Complex Program of Seismic Risk Reduction in the RA Territory (1999)
	The Complex Program of Seismic Risk Reduction in Yerevan city (1999)
	The Resolution of the Government of RA on establishment of the list of critical important and general facilities in the field of seismic protection (2003)
<b>Regulation</b>	“National Survey for Seismic Protection” Agency (2008)



## **There are four types of seismic network in Armenia:**

- Telemetric Network**
- Vayk Network**
- Regional Network**
- Global Seismograph Network Station (IRIS/GSN)**

In Garni, at the geophysical observatory, installed seismic recording station. This station included in the IRIS Global Seismographic Network (GSN) and providing seismographic data to research earthquake hazard mitigation and the verification of a Comprehensive Test Ban Treaty (CTBT). It is also the goal to provide real-time access to its data via satellite. GSN Garni station meet this goal.

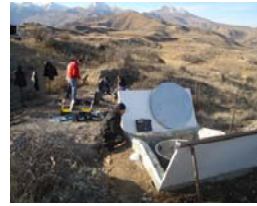


- ★ Guralp Network
- ★ Vayk Network
- ▲ Regional stations
- ★ IRIS

### GURALP STATION



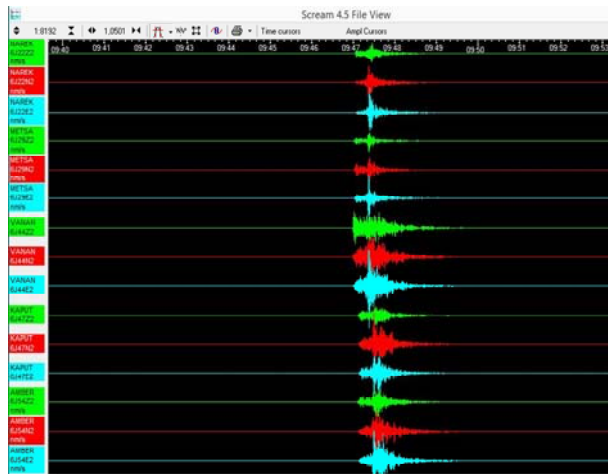
### VAYK STATION



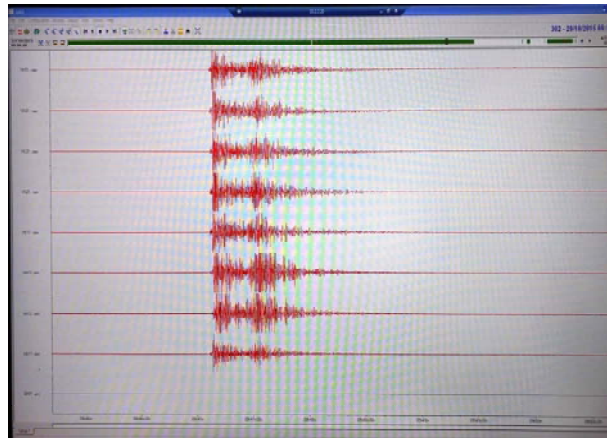
### NEW BUILDING OF NSSP IRIS STATION



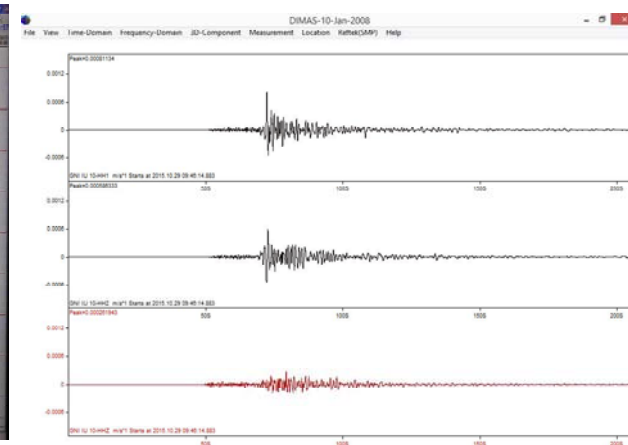
### Seismic record of Guralp station



### Seismic record of Vayk station



### Seismic record of IRIS station



# Real-Time Seismic Intensity Display System of the Republic of Armenia in Cooperation with JICA

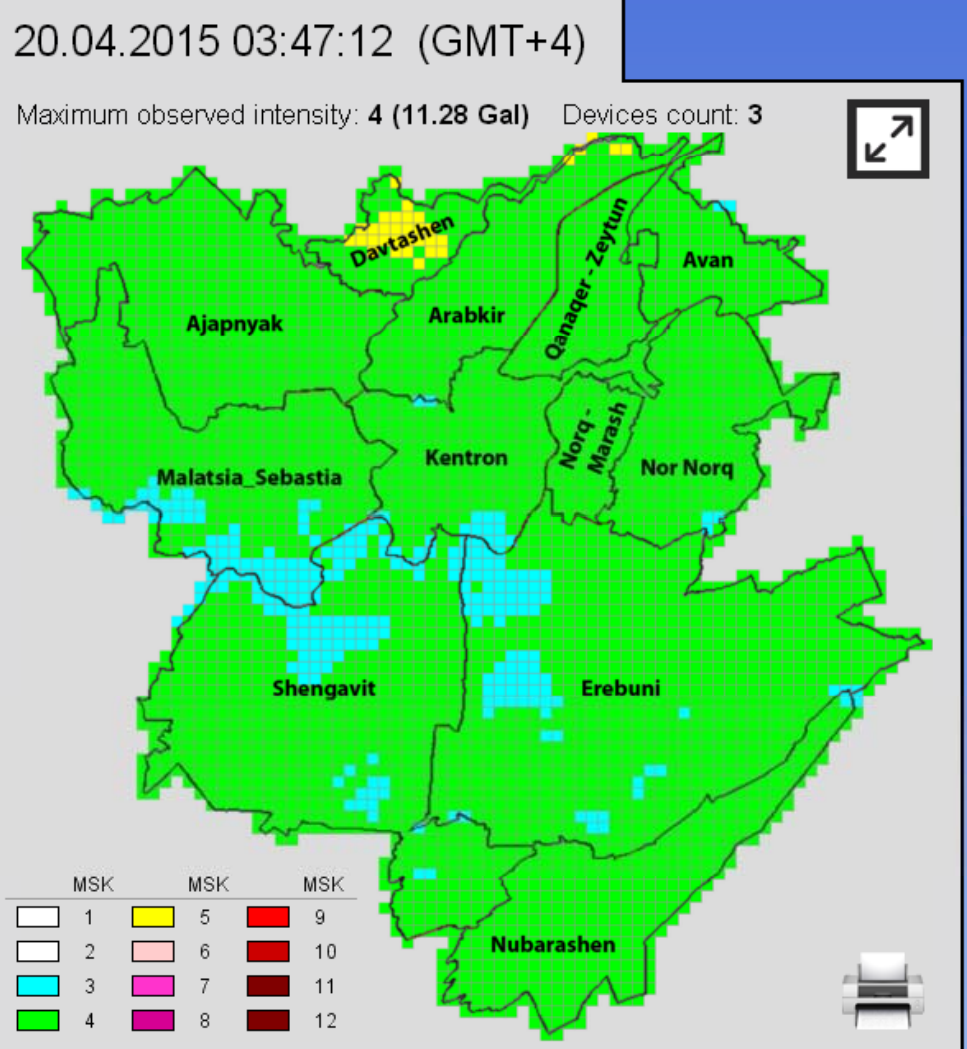
**Devices**

ID	Name	Signal	Intensity
1	NSSP		-
2	GeoChemical		-
3	YSU	■	2
4	Parakar	■	4
5	Erebuni	■	3

[Map View](#)

**Event Log**

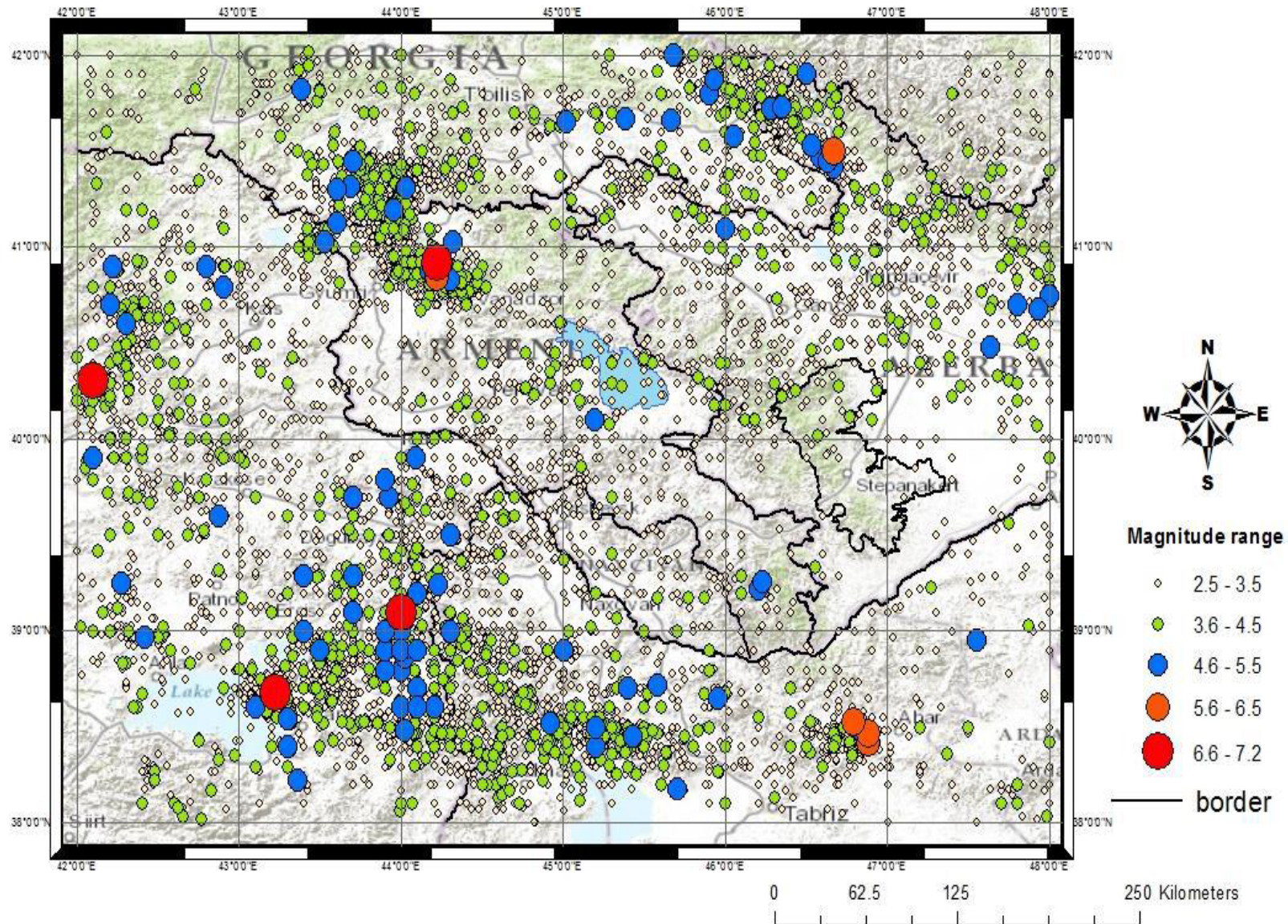
ID	Time	Intensity
1	20.04.2015 03:47:12	4
2	19.09.2012 20:00:00	6



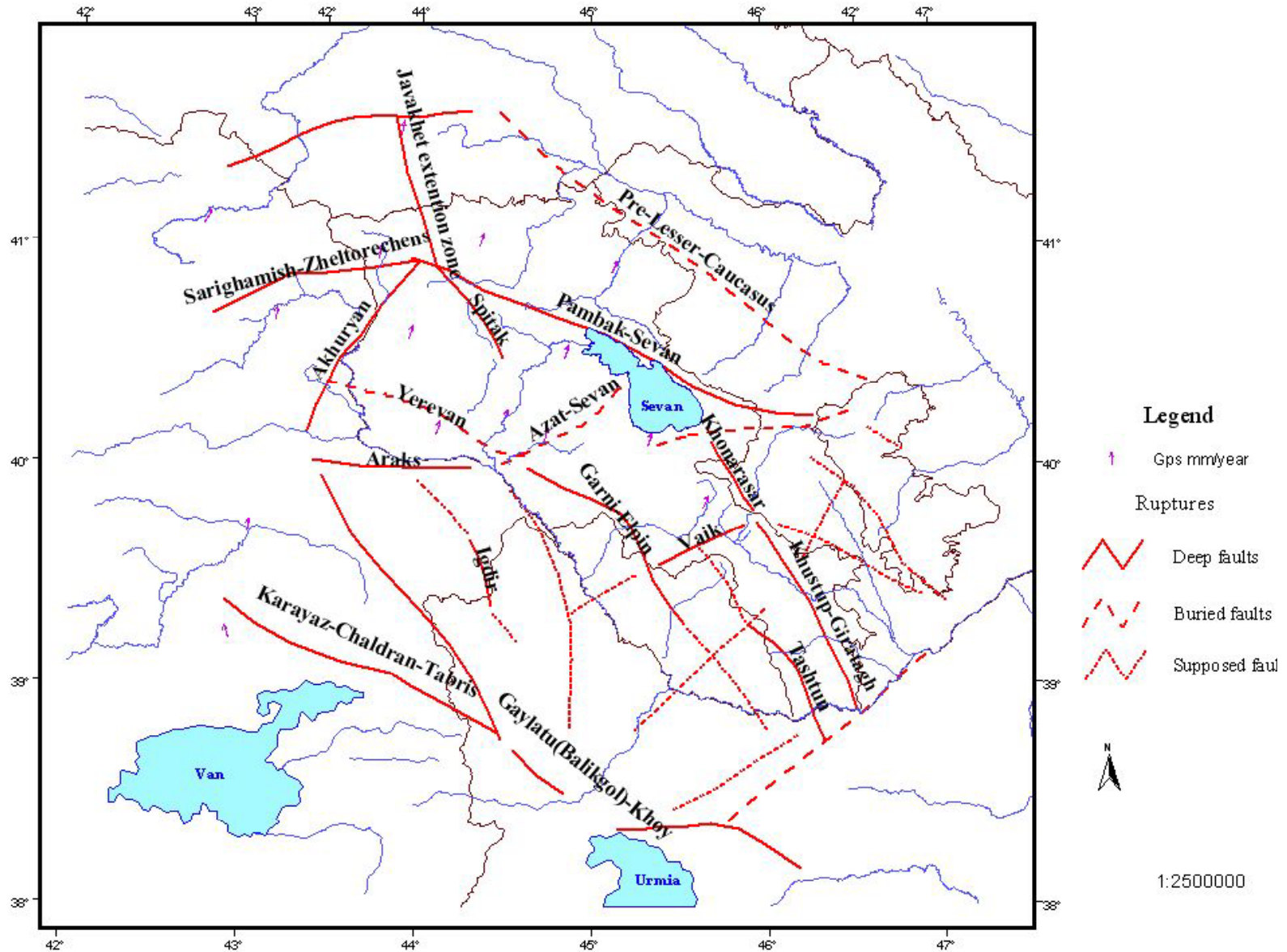
National Survey for Seismic Protection of the MES of the Republic of Armenia



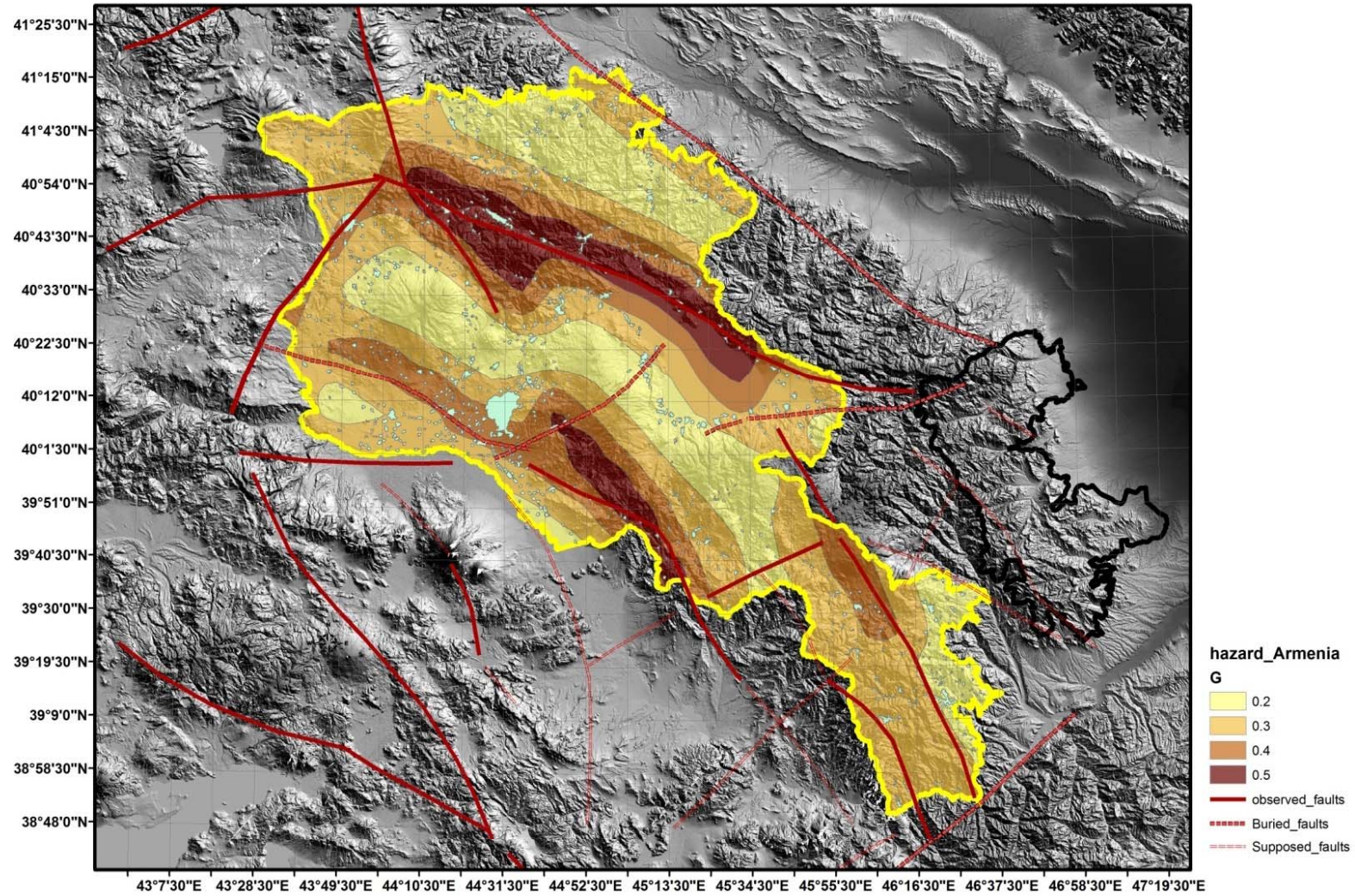
# Map of the epicenters of earthquakes with magnitude $M \geq 2.5$ for time period 1962-2015



# MAP OF FAULTS

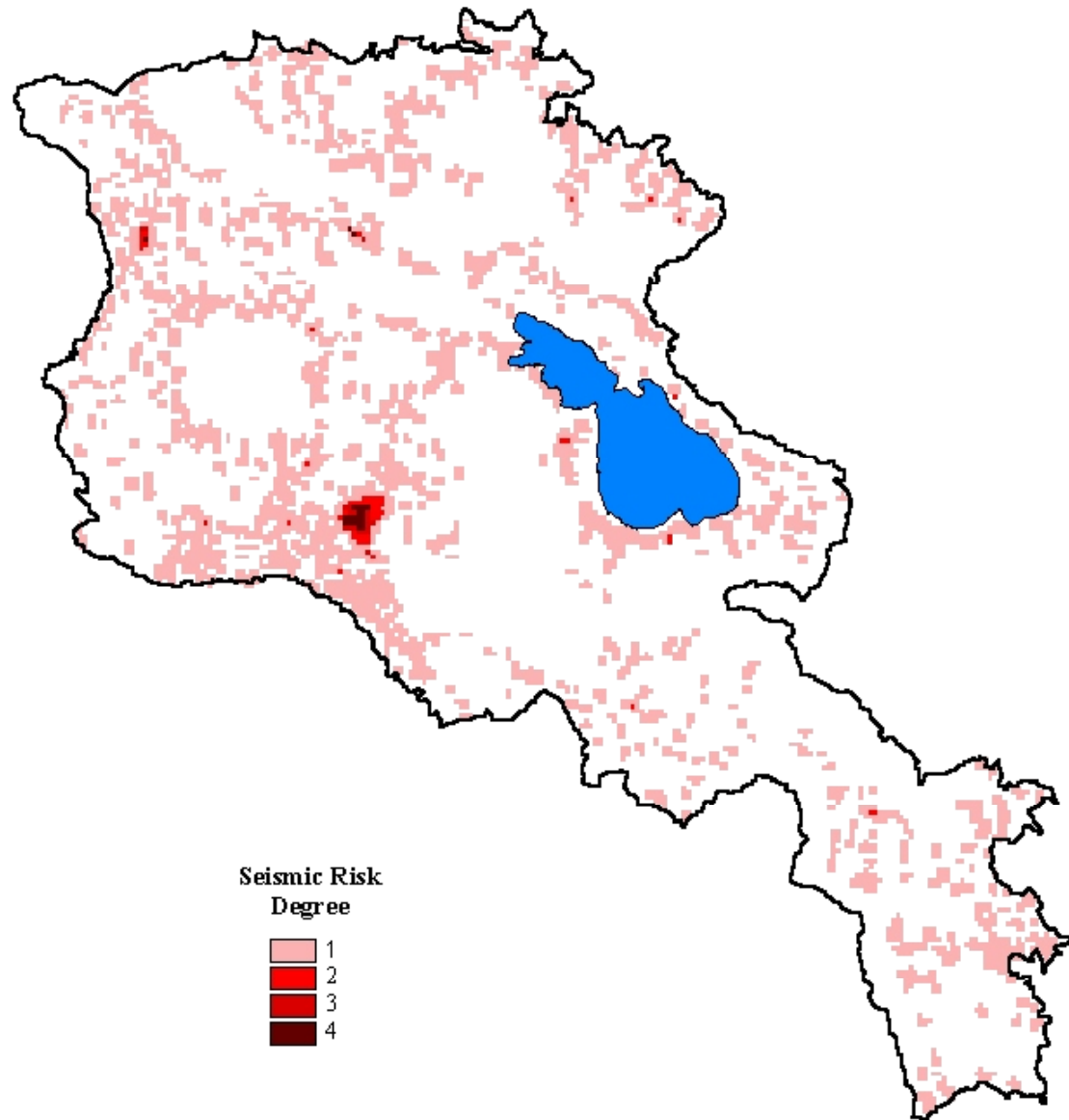


# SEISMIC HAZARD MAP OF RA





# SEISMIC RISK ASSESSMENT MAP OF RA



# Disaster Management Strategy based on the Hyogo Framework of Action (HFA)

MES develops National DRR Strategy, Crisis Management Centers and National Disaster Observatory. Armenia has also registered a progress in the implementation of HFA, and among the key developments towards establishment of decentralized DRR system has been decree of the MES on appointment of Heads of MES Regional Representations as HFA implementation focal points at the country 11 regional (marz) level.

## Crisis Management Center in Yerevan



# Crisis Management Centers in Marzes



## Disaster Education and Human Resource Development in Armenia

**The state training system includes the following subsystems, which are done regularly:**

- Training of target groups beginning from kindergartens and schools
- Educational programs, methodical manuals, relevant interactive materials
- TV and radio programs, publications in mass media
- Social-psychological preparedness.

Armenia collaborating with ADRC (since 2000) and JICA (since 2007) in the frame of various projects and programs implements the research, education and training for the DRR specialists who acquired and shared valuable Japanese experience.

Ministry of Science and Education together with the Ministry of Territorial Administration and Emergency Situations in the frame disaster risk reduction program will submit to National Assembly proposals and additions for the Law “On Public Education” aiming at inclusion disaster risk reduction elements in the school curricula.

## Disaster education at kindergartens and schools



## Disaster education at companies and municipalities and local authorities



# Tasks of Building and Structure Seismic Risk Evaluation Division

- Data base creation for urban planning of towns and settlements using GIS technology
- Urban planning detailed mapping
- Estimation of facilities' design seismic resistance
- Seismic risk evaluation for towns and settlements
- Seismic risk mapping for towns and settlements
- Rapid damage estimation for towns and settlements in epicentral zone in case of major earthquake.

# The Armenian NSSP Task Force members

- seismologist-seismotectonist
- seismologist
- geo-technician
- earthquake engineer
- communication engineer
- public awareness expert
- logistics, rescuer
- psychologist

# **The basic goal of NSSP is Seismic Risk Reduction in Armenia**

## **SRR Strategy includes:**

- ✓ **Seismic Hazard and Risk Assessment;**
- ✓ **Vulnerability reduction in urban areas, including reinforcement and upgrading of existing buildings, design of new codes and standards;**
- ✓ **Public awareness, people education and training;**
- ✓ **Early warning and notification;**
- ✓ **Partnership establishment, involving public and private organizations;**
- ✓ **Risk management, including Emergency Response and Rescue Operations;**
- ✓ **Disaster relief and people rehabilitation;**
- ✓ **Insurance;**
- ✓ **State disaster Law and regulations.**





# Armenian NSSP Main Tasks:

- **seismic monitoring**
- **current seismic hazard assessment**
- **seismic and secondary hazard assessment**
- **seismic risk evaluation and reduction, early warning**  
**including**
  - ✓ **earthquake engineering**
  - ✓ **population education and training**
  - ✓ **preparedness of government officials  
and local authorities**
  - ✓ **development of early warning system**
  - ✓ **compiling of hazard and maps**



**ARMENIAN  
NSSP**

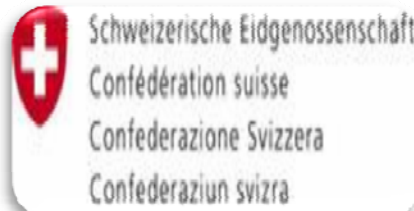
# INSARAG

## Armenia Became A Member of International Rescue Family



Two Urban Search and Rescue Teams of the RS of the RA MES successfully underwent a 36-hour rather difficult external classification exam-exercise. A positive conclusion of peer experts was needed to undergo the classification process of **INSARAG**. The purpose of the meeting was to summarize the results of the last qualification phase of the examination held from 1 to 4 September 2015.

# INTERNATIONAL COOPERATION AND PARTNERSHIPS



# Thank you for attention



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