



Good practice

Mitigation planning for earthquakes in Greece

Although earthquakes can't be predicted, the number of casualties and the caused damage to properties can still be minimized if proper spatial planning and regulations concerning constructions are implemented. Moreover, informing people about earthquake risk and taking an appropriate emergency response can have very positive results. Earthquake risk reduction is an indispensable investment for every earthquake-prone city and region. Since Greece is the first country in Europe and sixth worldwide in seismic activity, all the above show that the implementation of an antiseismic policy is of great importance for the country.

Profile of seismic activity in Greece

Greece is one of the world's most seismically active countries. Earthquakes are frequent and

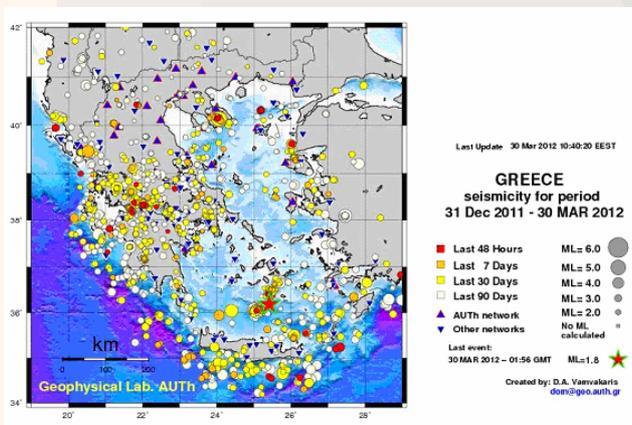


Figure: seismic activity in Greece for a three months period

there are many incidents yearly. However, most of them do not cause damages since they have small size. Moreover, many of the earthquakes that strike Greece have their epicentres under the sea. While they can shake up the surrounding islands, they rarely cause severe damage. As we can see from the figures created at the Aristotle University of Thessaloniki there is extensive seismic day to day activity in Greece but not in a scale that could cause damages and casualties. However, the frequency of earthquakes makes it inevitable that some of them happen near inhabited places and are strong enough to potentially

Place	Date	Size	Casualties/Damages
Thessaloniki	20/6/1978	6,5	45 casualties, 220 injured people, eight-floor building collapsed, 9.480 buildings that had to be demolished
Volos-Almiros	09/07/1980	6,5	24 injured people, 5.222 buildings destroyed
Alkionides	24/2/1981	6,7	20 casualties, 500 injured people, 22.554 buildings that couldn't be repaired
Kalamata	13/9/1986	6,0	20 casualties, 80 people injured, 4 buildings collapsed, total destruction of the village Eleochoi, 20% of the buildings in Kalamata had to be demolished
Kozani-Grevena	13/5/1995	6,6	Extensive damages to buildings, while many buildings collapsed
Aegio	15/6/1995	6,1	26 casualties, 2 buildings collapsed, extensive damages
Parnitha Athens	07/09/1999	5,9	143 casualties, 400 injured people, 37 buildings collapsed, extensive damages

Table: the greatest earthquakes in Greece 1978-1999 (Richter magnitude scale)

cause great damage and casualties. The earthquakes of 1978 in Thessaloniki, 1981 in Alkionides, 1986 in Kalamata, 1995 in Aegio and 1999 in Athens are examples of earthquakes that caused extensive damages and casualties. The greatest earthquake in Greece during the last decades was that in 1953 in Kefalonia: 7,2 degrees in Richter scale. On the islands of Kefalonia, Zakynthos and Ithaki 456 people died, 2.412 people were injured and 27.659 buildings collapsed when the total number of buildings on the three islands was about 33.000.

Main axes of antiseismic policy

The antiseismic policy in Greece is developed in two main axes which are:

- The pre-earthquake measures for prevention, preparedness, planning and awareness, which aim to reduce the earthquake risk and minimize the devastating effects of earthquakes.
- The measures after the occurrence of an earthquake for the effective treatment and management of emergencies caused by the earthquake, targeting particularly in the relief and housing of earthquake victims and in the rehabilitation of affected areas.



planning involves regional and local planning as well.

An organization for the creation of antiseismic policy

The earthquakes in Thessaloniki (1978) and Alkionides (1981), which caused extensive damages and many casualties, urged the creation of an organization that would set the antiseismic policy of the country by using in the most efficient way the results of scientific research on that field. Finally, in 1983 the Organization for Antiseismic Planning and Protection was founded. Some of



Photos: extensive damages in Achaia after an earthquake struck in 2008

The following two services specify and apply the antiseismic policy in the country:

- *The Organization for Antiseismic Planning and Protection*, focusing on the activities concerning pre-earthquake measures and on the first measures after the earthquake (mainly in the fields of information, motivation and creation of the institutional framework of remedies).
- *The Earthquake Rehabilitation Service* with main activities the temporary and permanent housing of people and the rehabilitation and reconstruction of areas affected by earthquakes.

Below we will present some of the most important points concerning mitigation and preparedness, while we will also show how centralized

the basic goals of the organization are:

- Gathering of accurate information, from relevant scientific bodies, and use it for the creation of an effective antiseismic policy.
- Helping the evolution of scientific knowledge and technology in Greece by supporting applied research in fields like seismology and earthquake-resistant constructions.
- Establishing new regulations and monitoring methods that upgrade the seismic capacity of buildings and infrastructure.
- Promoting of social awareness and consciousness concerning seismic risk by ongoing training and informing of the public, so that every citizen knows what to do before, during, and after an earthquake in order to effectively protect his life and property.

The organization is supported by six scientific committees. The members of the committees are distinguished scientists and experts. One of the committees works on the assessment and evaluation of seismic risk, while the others work on the assessment of the short term evolution of seismic activity, on the support for the creation of antiseismic regulations, on seismotectonics, on antiseismic constructions and on social antiseismic defence.

Scientific research

The seismological centres of the country have been supported to expand and improve the networks of seismographs and accelerographs and integrate them, without losing their autonomy, in a single network, the recordings of which will be available to all scientific bodies. This contributes to the creation in practice of a National Network of seismographs, which represents a constant



Photo: a seismograph centre in Greece

objective of the Greek State and ensures accurate and timely information to the State for the seismic risk.

Moreover, the Organization for Antiseismic Planning and Protection supports various projects of applied research in the fields of seismology, engineering seismology and seismotectonics. These projects offer useful findings that contribute to a more efficient assessment and management of



Photo: Rescuers after the earthquake of Aegion (1995)

seismic risk in Greece. Additionally, projects on antiseismic technology in constructions give extremely useful results that can be used to improve the seismic behavior of constructions.

Public awareness

Public awareness is a vital aspect of mitigation policy and various actions are taken to that direction:

- Educational programmes are being conducted to students and teachers as parts of ongoing programmes for antiseismic protection in schools. Moreover, at the beginning of the school year in all Greek schools a preparedness exercise for earthquakes takes place.
- The Organization for Antiseismic Planning and Protection makes campaigns for public awareness and publishes various leaflets such as "Earthquake-Knowledge is Protection", "Memorandum of actions for antiseismic protection of schools", etc
- The Organization for Antiseismic Planning and Protection is trying to inform people through their web site (www.oasp.gr) which includes data on earthquakes and information about protection measures that people should take. Moreover, all the leaflets published by the organization can be found there, while there are also scientific data, statistics about earthquakes, relevant projects and an interactive part of the

webpage where children can learn about earthquakes by playing.

- The Organization for Antiseismic Planning and Protection is participating with other public bodies and local authorities in a programme which is called “protecting myself and the others”. The aim of the programme, which lasts 100 hours during a 2,5 months period, is to train volunteers in risk and crises management. So far, about 6000 volunteers have been trained all over the country.



Photo: Buildings collapsed after the earthquake of Aegion (1995)

Enhancing the seismic capacity of constructed environment

The Antiseismic Regulation at each country is the legal text that includes the rules that specify the minimum requirements for antiseismic constructions. The first Antiseismic Regulation was introduced in Greece in 1959 and was reformed in a large scale in 1985. Improving the relevant legislation is an ongoing process. In 1995 the New Greek Antiseismic Regulation was introduced, while since 2001 the Greek Antiseismic Regulation-2000 is in power. Since 2001 adjustments and additions have been made to the text of the Greek Antiseismic Regulation-2000. In 2003 the New Map of Seismic Hazard Zones was included in the Regulation. In this map there are three Seismic Hazard Zones, while in the previous one there were four.

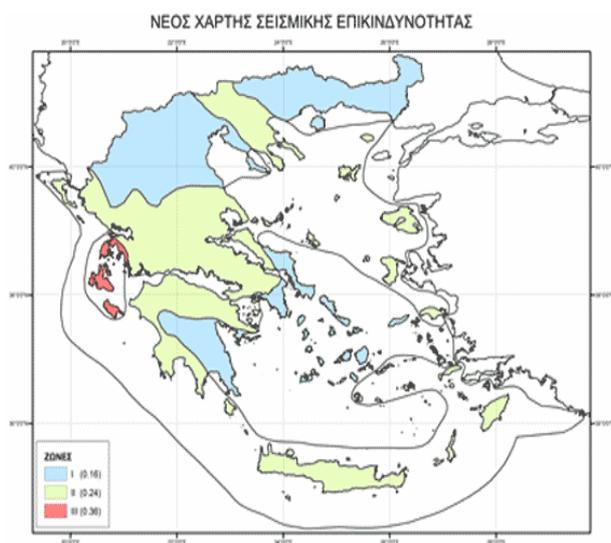


Figure: the New Map of Seismic Hazard

Another aspect of the antiseismic policy followed in Greece involves inspecting the condition of buildings. After an earthquake civil engineers from the Regions, the Municipalities and from services of the Ministry of Infrastructure perform inspections to buildings which are characterized as green (appropriate for use), yellow (temporary not appropriate for use) or red (dangerous for use). Then, depending on the case, the buildings which are not characterized as green are repaired or demolished. One of the scientific committees of the Organization for Antiseismic Planning and Protection has drafted the Regulation for the Repair of Buildings.

The inspection of the buildings in an area after an earthquake is not the only inspection that takes place.

Since 2001 the programme of “First Level Pre-Earthquake Inspections for Buildings of Public Use” has been implemented. According to the programme the Regional Units and the Municipalities create two member committees of engineers that perform inspections at buildings of public interest (public services, theatres, hospitals etc.).

The committee should fill in a form for every building they inspect. The forms are sent to the Organization of Antiseismic Planning and Protection, where the buildings are inserted into a database and get a “mark” indicating how safe they are in the case of an earthquake. In that way the organization has an overall view of the condition

of buildings of public interest across the county and can set priorities, deciding which buildings might not be safe and need further inspection. Then the services in charge are informed and a second more detailed inspection takes place. The results of the second inspection will indicate the buildings which need repairs or those that shouldn't be used.

Emergency plans on regional and local level

The role of the Regions and of Municipalities in cases of earthquakes is very important. The Organization for Antiseismic Planning and Protection organizes workshops with representatives

from the Departments of Civil Protection of the Regional Units about earthquakes, focusing on



Moreover, the Regional Units have to organize “on the map” exercises with all the involved authorities in order to specify and coordinate their actions in the case of earthquakes.

The organization for Antiseismic Planning and Protection, in order to help Regions to set their emergency plans, provides a handbook which is called “Handbook on setting emergency plans for the case of earthquakes”. The handbook includes a chapter for the civil protection plan (aims, basic characteristics of the plan, fundamental planning requirements, and coordinating instructions), a chapter for earthquake risk assessment (definitions and concepts, seismic risk map), a chapter for the operational concept (stages, escalation and coordination of operations) and finally there is a dedicated chapter on the role and responsibilities



Photos: Landslides and cracks in the port of Lygia after the earthquake of Lefkas (2003)

planning, prevention and preparedness.

Similar meetings take place with representatives of the Municipalities. The competences of the Regions and the Municipalities are part of the plan of the General Secretariat of Civil Protection for Earthquakes which is based on the directions created by the Organization for Antiseismic Planning and Protection. Both Regional Units and Municipalities participate in the “First Level Pre-Earthquake Inspections” and in actions for public awareness, while they have to create memorandums of actions for the case of earthquakes and define the critical infrastructure and services.

of any operationally involved organization.

There are also guidelines and provisions concerning communications, human resource management and spaces/equipment for the creation of camps for earthquake-refugees.

Lessons learnt

Some of the lessons learnt from the processes of setting plans for earthquakes and managing the caused impact are the following:

- scientific research is of outstanding importance for the creation of an efficient



mitigation policy for earthquakes and should be taken into consideration when drafting the Antiseismic Regulation.

- emphasis should be given to public awareness. Special campaigns for students are needed in order to create a “culture of proper actions” for earthquakes.
- Panic can cause more casualties than the earthquake itself. People in areas having high seismic activity must learn to live with earthquakes and stay calm when an earthquake occurs.
- inspections of buildings after earthquakes are not enough. Methods for preventive inspections should be established.
- local authorities should have a detailed emergency plan since they bear the main burden of the problems caused by an earthquake, at least during the first hours.

The MiSRaR project

The MiSRaR project is about Mitigation of Spatial Relevant Risks in European Regions and Towns.

The project is a cooperation between seven partners in six EU member states:

- *the Safety Region South-Holland South, The Netherlands (lead partner)*
- *the city of Tallinn, Estonia*
- *the region of Epirus, Greece*
- *the province of Forlì-Cesena, Italy*
- *the municipality of Aveiro, Portugal*
- *the municipality of Mirandela, Portugal*
- *the Euro Perspectives Foundation (EPF), Bulgaria.*

The goal of the project is to exchange knowledge and experiences on risk mitigation in spatial policies. The project will result in a handbook in which the lessons on the mitigation process are described and the good practices from the partners are presented. The Risk Assessment and Mapping Guidelines for Disaster Management of the European Commission will be implemented in the handbook.

The MiSRaR project is cofinanced by the European Regional Development Fund and made possible by the INTERREG IVC programme.

www.misrar.eu

Contact information

*Nico van Os, general project manager MiSRaR,
Safety Region South-Holland South,
The Netherlands*

n.van.os@vrzhh.nl

*Batzias Nikos,
Member of the MiSRaR team,
Region of Epirus,
Greece*

nimpatzi@thesprotia.gr

Organization for Antiseismic Planning and Protection:

www.oasp.gr