

**European Commission  
Directorate General Environment  
Unit D3: Civil Protection**

**Earthquakes in Europe**  
**National, international and European policy  
for the prevention and mitigation of seismic disaster**

**Fereniki Vatavali**

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This report was written between 2003-03-01 and 2003-07-31 under the supervision of Stein HENRIKSEN, and the kind contribution of :

Pia BUCELLA (ENV),  
Ernst SCHULTE (ENV),  
Urlik BLOMQVIST (ENV),  
Panagiotis ALEVANTIS (DGT),  
Pascal BAR (ENTR),  
Fabio TAUCER (JRC),  
Ana Lisa VETERE ARELLANO (JRC),  
Marie YEROGIANNI (RTD),  
and  
Dina VAIYOU (NTUA/ Athens),  
Miranta DANDOULAKI (EPPO/ Athens),  
Konstantinos HOLEVAS (GSCP/ Athens).

## **1. Introduction**

Natural hazards, such as earthquakes, landslides and floods, are often more devastating, in terms of loss of life and environmental damage, and also have potential to precipitate technological hazards. It is apparent that several types of natural hazards have the potential to cause large numbers of fatalities. The hazards that cause the largest numbers of fatalities in one event are earthquakes. Despite the recent scientific evolution, earthquakes are still the most unpredictable and feared natural disaster.

In fact they seem to occur without any previous warning. They also last a few seconds, but they can cause severe human losses and material damage. In the 1990s there have already been 13 earthquakes worldwide where fatalities have exceeded 1000 people.

It is not possible to predict earthquakes. However, their physical consequences are highly predictable once we know which are the potential seismogenetic sources that may affect an area and the physical and human characteristics of that same area. Though we can not prevent earthquakes from occurring, their affects can be quite minimised through effective prevention measures and reduction of vulnerability.

The aim of this document is to underline the seriousness of the seismic risk in Europe, to present the measures and the initiatives that have been taken in national level regarding earthquakes, as well as the relevant activities and initiatives that of the European Union institutions and other international organisations. The main target of this project is to contribute to the development of the European Union policy against seismic disasters.

## 2. Earthquakes in Europe

### 2.1 Seismic risk

**Earthquake** can be defined as the shaking of earth caused by waves moving on and below the earth's surface and causing: surface faulting, tremors vibration, liquefaction, landslides, aftershocks and/or tsunamis.

The International Strategy for Disaster Reduction (ISDR), that is designed to proceed from protection against hazards to the management of risk through the integration of risk reduction into sustainable development, revolves around three major concepts, namely natural hazards, vulnerability and risk, for which the following definitions apply:

**Natural hazards** comprise phenomena such as earthquakes, volcanic activity, landslides, tsunamis, tropical cyclones and other severe storms, tornadoes and high winds, river floods and coastal flooding, wildfires and associated haze, drought, sand/dust storm, infestations.

**Vulnerability** to disasters is a function of human actions and behaviour. It describes the degree to which a socio-economic system is either susceptible or resilient to the impact of natural hazards and related technological and environmental disasters. The degree of vulnerability is determined by a combination of several factors including hazard awareness, the condition of human settlements and infrastructure, public policy and administration, and organized abilities in all fields of disaster management. Poverty is also one of the main causes of vulnerability in most parts of the world.

In this context, a **natural disaster** is to be understood as the consequences of the impact of a natural hazard on a socio-economic system with a given level of vulnerability which prevents the affected society from coping adequately with this impact.

The **risk** of a disaster is the probability of a disaster occurring. The evaluation of a risk includes vulnerability assessment and impact prediction taking into account thresholds that define acceptable risk for a given society.

**Seismic risk** is the possibility of a seismic disaster, that has as a result loss of life, loss of property, or loss of function of buildings, structures or utilities because of a complex combination of seismic hazard and vulnerability.

<http://www.unisdr.org/unisdr/framework.htm#DEFINITION>

### 2.2. Seismic risk in Europe

Earthquakes are widespread in the Europe. The most destructive events occurred in the Mediterranean countries, particularly Greece, Italy and Turkey, which are in the collision zone between the Eurasian and African crustal plates. Albania and Romania have experienced major earthquakes. Smaller earthquakes are felt by other nations, although there is generally little damage. The following map illustrates the seismicity in Europe

<http://reports.eea.eu.int/92-9157-202-0/en/3.8.pdf>

Some examples of the most destructive earthquake that have occurred since 1976 in the European Union, acceding and candidate countries resulting to severe impact are included in the following table. Annex 1 contains an extensive table with all the significant earthquakes that have hit Europe.

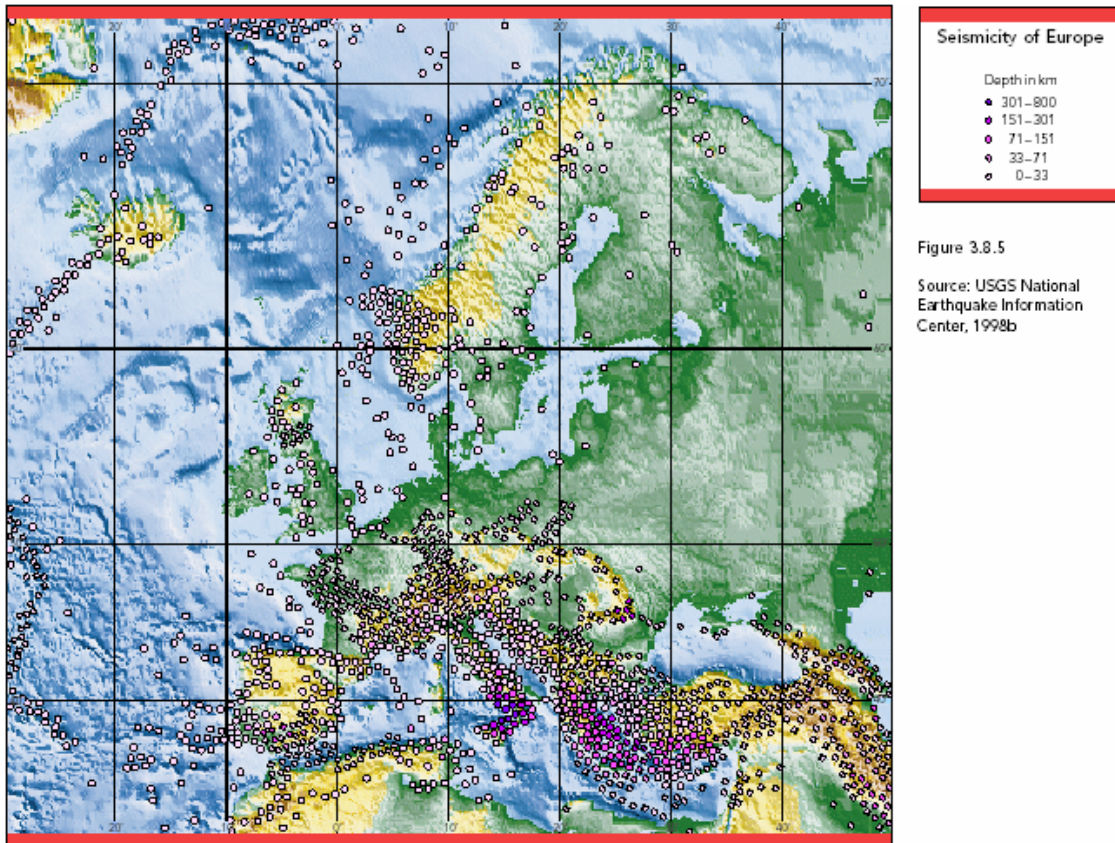


Figure 3.8.5

Source: USGS National Earthquake Information Center, 1998b

YEAR	COUNTRY/ REGION	IMPACTS
1976	Greece, Thessaloniki	45 dead, 220 injured, major damage
1976	Italy, Frioul (twice)	997 dead, 2400 injured, 189000 homeless
1979	Italy, Umbria	5 dead, numerous injured, 2000 homeless
1980	Italy, Campania	2739 dead, 8 816 injured, 334000 homeless
1980	Portugal, Azores	50 dead, 86 injured, 21296 homeless
1981	Greece, south regions	19 dead, 500 injured, 12220 buildings damaged/destroyed
1983	Belgium	1 dead, 26 injured
1984	Italy, central regions	7500 homeless
1986	Greece, Kalamata	20 dead, 300 injured, 2000 buildings damaged/destroyed
1990	Romania, Bucharest-Braila - Brasov area	9 dead, 700 injured, severe damage
1990	Italy, SW Sicily	19 dead, 99 injured, 14596 homeless
1992	Netherlands, Limburg	Extensive damage
1992	Turkey, north-west area	498 dead, 2000 injured, 2200 building damaged
1995	Cyprus, Paphos	2 dead, 5 injured, several damages
1995	Greece, Egion	26 dead, 60 injured, extensive damage
1995	Greece, Grevena-Kozani	25 injured, 5000 homes destroyed, 7000 homes damaged
1997	Italy, central region	11 dead, more than 100 injured, 80000 destroyed/damaged
1999	Turkey, Bolu-Duzce	894 dead, 4948 injured, extensive damage
1999	Greece, Athens	143 dead, 1600 injured, 50000 homeless
1999	Turkey, Istanbul area	17118 dead, 50000 injured, 500000 homeless
1999	Spain, Mula area	20 injured, buildings damaged
2002	UK, Mansfield	minor damage
2002	Italy, south regions	29 dead, 135 injured, 70% of the houses damaged

<http://neic.usgs.gov/neis/eqlists/significant.html>

Given that the low term and the medium term impacts of the earthquakes are very serious in several aspects of life, Member States have tried to establish national policy and take proper measures in order to minimise the seismic disasters. On the other side, important international organisations make their own efforts for the development of technologies and policies that will lessen the effects earthquakes. From its side, European Union supports certain initiatives and tries to launch a basis for co-operation and technical evolution in the same field.

### 3. National policy

This chapter intends to make a short presentation of the national policy of those Member States that are on active seismic zones. Therefore, a short description of the policy goals and tools, as well as a short presentation of the national agencies of Greece, Italy, Portugal and Spain on this field follows.

#### 3.1 Greece

##### 3.1.1. Seismic protection policy

Greece has paid a heavy toll in terms of life loss and has suffered a serious damage to property and cultural heritage due to earthquakes. Eventually this experience has led to forming over the years an earthquake protection policy framework. The main lines of the earthquake protection policy are:

- To mitigate seismic risk in the built environment
- To ensure preparedness at central government, prefecture and local authorities level
- To upgrade earthquake awareness and to keep the public informed on seismic safety issues
- To improve emergency response and aid provision.

The following legislative tools consist the basis of the antiseismic policy in Greece:

- ΦΕΚ 534B/20-6-1995, New antiseismic regulation.
- ΦΕΚ 315B/17-4-1997, New reinforce concrete regulation.
- ΦΕΚ 1329/6-11-2000, Greek regulation of reinforce concrete.

##### 3.1.2. Agencies in the field of seismic protection

The **Earthquake Planning and Protection Organisation** (EPPO) under YPEHODE, established in 1983, is the competent authority to guide the national earthquake protection policy and to co-ordinate the state and private resources for its implementation. EPPO assigns and supports research projects on earthquake protection issues. Collaboration with foreign institutions and authorities, co-operation with the scientific community and a leading role in promoting seismic safety in the country, are among its tasks. A variety of EPPO publications about prevention of earthquake disasters and earthquake protection are available.

<http://www.oasp.gr>

The **Earthquake Rehabilitation Service** (YAS) under YPEHODE has as main task the implementation of the policy on earthquake reconstruction of buildings at national, prefecture and local level. YAS supervises the rehabilitation and reconstruction procedure and the Service keeps records of the state funds expenditure for the reconstruction and repair of earthquake damaged buildings.

The **General Secretariat of Civil Protection** (GSCP), established in 1995, under the Ministry of Interior is mainly involved in the field of civil protection. It is

assigned by law to comprise all measures as well as civil and private means for the protection of the population against all types of disasters (natural, technological, etc., at national, regional and local level).

<http://www.civilprotection.gr/>

The **Institute of Engineering Seismology and Earthquake Engineering** (ITSAK) was established in 1979, in Thessaloniki, after the 1978 earthquake disaster. The main objective of ITSAK is applied research in the fields of engineering seismology, soil dynamics and earthquake engineering aiming at upgrading the Greek Seismic Design Code and mitigating earthquake damage. Further development of structure monitoring and laboratory techniques on structural mechanics, as well as involvement in public and private projects by performing special studies and providing consulting, participation in national and international research projects on seismic-risk mitigation and expansion of collaboration with relevant research institutes and industry in Europe and beyond, with emphasis on the Eastern Mediterranean and Balkan regions, are included in the research and activity programme of the institution for the future.

<http://www.itsak.gr>

The **Geodynamics Institute** (GI) of the National Observatory of Athens aims at the study and promotion in the fields of seismology, of the physic of the earth's interior, geophysics, volcanology, geothermy and seismotectonics. The main tasks of GI are collection and processing of seismological-geophysical parameters, the performance of research projects, the elaboration of relevant studies, the training and services to third bodies.

<http://www.gein.noa.gr>

University departments and laboratories in most Greek universities carry out significant research in a wide range of scientific fields relevant to earthquake protection. Significant research activity has been carried out by the Department of Civil Engineering and the Department of Rural and Surveying Engineering of National Technical University, the Faculty of Geology of National and Kapodistian University of Athens and the Department of Civil Engineering of University of Patras.

## **3.2. Italy**

### **3.2.1. Seismic protection policy**

The strategy of seismic disaster prevention that is followed by the Italian authorities through National Seismic Survey is based on:

- Continuing the actions of prevention by up-dating the classification and legislation.
- Defining the seismic risk all over the national territory before setting up priorities of intervention. In order to achieve this it is necessary to study the hazard, the vulnerability and the exposition.
- Launching programmes of intervention for the reduction of the seismic risk.

The following legislative tools consist the basis of the antiseismic policy in Italy:

- « Regulations for the constructions with special regards to the seismic zones » (Law n. 64 of 02.02.1974)
- « Approval of the models for the assessment of the damages to cultural heritage» (Decree of 03.05.2000)

### 3.2.2. Agencies in the field of seismic protection

The **National Seismic Survey** of the Italian Civil Protection Department is under the Ministry of Internal Affairs. The main objectives of National Seismic Survey are:

- organising information campaigns and educational programmes.
- the documentation of the earthquakes that have occurred in Italy, the seismic monitoring in Italy and the development of preliminary reports about earthquakes.
- the support and promotion of relevant legislation.
- the development of technical reports.
- seismic observation of the structures.

<http://www.serviziosismico.it>

<http://www.protezionecivile.it>

The competences of the **National Group for the Defence against Earthquakes** (GNDT) were defined by the Interministerial Decree (Ministero per il Coordinamento della Protezione Civile di concerto con il Ministero dell'Università e della Ricerca Scientifica e Tecnologica) of 10 February 1993 as following:

- supply scientific, technical and legislative consultation regarding the field of defence against earthquakes, to the Ministries and regional, local or other public authorities.
- Promote interdisciplinary research for the acquisition and the improvement of the seismologic, geologic and engineering knowledge on this field by elaborating specific programmes of research.
- Implement the actions of scientific or technical intervention, particularly of geological applications and engineering, within the initiatives of the Department of Civil Protection.
- co-operate on familiar research initiatives with other countries, by improving the exchange of international experience on this sector.

<http://gndt.ingv.it>

The legislative decree n. 381 of 29 September 1999 founded the **National Institute of Geophysics and Vulcanology**, which become one of the largest European research institutions. The Institutes' main research fields are in geophysics, seismology and volcanology. The Institute comprises eight main Departments located in five main centres. The main goal of the departments of the National Institute of Geophysics and Vulcanology is to promote, execute and co-ordinate studies and researches on the physical phenomena of the Earth and their practical applications.

<http://www.ingv.it>

The **Department of National Technical Services** has further involvement on the defence strategy of Italy against seismic risk.

### 3.3. Portugal

#### 3.3.1. Seismic protection policy

The National Service of Civil Protection following its objectives and domains of actions has established co-operation between the services and research institutions and the civil protection has developed activities that aim at the evaluation and minimising of the seismic risk. It's main tasks are :

- Realising exercises
- Informing the public and rising of the public awareness and the interest of the institutions.
- Participating in missions of observing earthquakes that have occurred in different parts of the world in order to gain experience (Northridge –Los Angeles- earthquake 17 January 1994, Azores earthquake 7 July 1998, Tyrkey earthquake 1999).
- Contributing to the establishment of an assembly of seismic network LAPSIS (IST).
- Evaluating the seismic vulnerability of works of art.
- Evaluating the seismic risk in Lisbon Metropolitan Area and bordering Communes.
- Evaluating the seismic risk in Algarve, reported in 2001.

The following legislative tools consist the basis of the antiseismic policy in Portugal:

- Resolution 91/81, of 23 April - Programme of immediate shares for minimizing the seismic risk. (DR N° 106, I, 09MAI81)
- DEC. LEI N° 235/83, of 31 May – Regulations of safety and shares for the constructure of buildings and bridges (DR N° 125, I, 31MAI83)
- Order n°32/97, of 21/7/97, of the Ministry of Internal Administration, determines that the Lisbon Metropolitan Area (AML) and the boardering municipalities of Benavente, Salvaterra de Magos, Cartaxo, Alenquer, Sobral de Monte Agraço, Arruda dos Vinhos e Torres Vedras, is object of a group of activities leading to:
  1. analisis of seismic risk (Phase 1) and
  2. efficient planning of emergency for the region (Phase 2).

[http://www.snpc.pt/SNPC2000/RISCOS/naturais/sismos/risco\\_sismico\\_AML.htm](http://www.snpc.pt/SNPC2000/RISCOS/naturais/sismos/risco_sismico_AML.htm)

#### 3.3.2 Agencies in the field of seismic protection

The **National Service of Fire Brigade Civil Protection** (SNPC) is under the Ministry of Interior Administration is mainly involved in the field of civil protection. It's activities are developed according to the good of the state and the citizens with the purpose of preventing risks related to serious accidents, natural or technological disasters or calamities, attenuating the effects of the disasters and helping people in danger.

<http://www.snbpc.pt>

The **National Laboratory of Civil Engineering** (LNEC) is a public institution of science and technology, which is subject to the Ministry for Public Works,

Transports and Housing, covering the broad field of civil engineering. The LNEC was created in 1946 and was a result of the merger between the Laboratory for Testing and Study of Materials of the Ministry for Public Works and the Centre for Civil Engineering Studies based at the Technical University of Lisbon. This twofold aspect, covering research and experimental work, shaped decisively LNEC's future development. Major objectives of LNEC's activity are innovation by the implementation of four year research plans, application of new technologies in studies under contract with a view to solve specific problems within the framework of civil engineering and the building construction industry and diffusion in technical and scientific circles of the results of its activities.

<http://www-ext.lnec.pt/LNEC/english.htmlb>

The present orientation of **Laboratory of Tectonophysics and Experimental Tectonics** (LATTEX), under the Faculty of Science, University of Lisbon, is based on the essential idea that progress in Earth Sciences can only be achieved through interdisciplinarity, which has been confirmed by all the recent evolution in Geodynamics. This goal is presented at the general level of Earth Sciences, approached in the perspective of study of a global and open Dynamic System through participation in ICTE and international cooperation mainly in the European Program EUROPROBE.

<http://www.fc.ul.pt/lattex/>

### 3.4. Spain

#### 3.4.1. Seismic protection policy

The strategy of seismic disaster prevention that is followed by Spain is based on the following legislative tools:

- Norm of anti-seismic construction: general part and buildings (NCSR-02), 19687 real decree 997/2002, of 27 September, Ministerio de Fomento (Promotion Ministry)

The objective of this Norm is the definition of the criteria that should be followed in the Spanish territory in order to take into account the seismic risk in one project, construction or maintenance of constructions. The purpose of those criteria is to avoid loss of human lives and to reduce the damages that might happen because of future earthquakes. The promoter can require major benefits than those indicated in this Norm, for example for the maintenance of the function of the essential services.

<http://www.proteccioncivil.org/centrodoc/legisla/NCSR-02.pdf>

- Resolution of 5 May 1995, of the State Registry of Interior, for which there is available the publication according to Council of Ministers that approves the basic guidelines of civil protection planning with regards to seismic risk. (BOE of 25 May 1995).

The resolution provides the guidelines for the basic elements and the general structure of the civil protection planning against the seismic risk.

[http://www.proteccioncivil.org/centrodoc/legisla/r\\_9512364.htm](http://www.proteccioncivil.org/centrodoc/legisla/r_9512364.htm)

### 3.4.2. Agencies in the field of seismic protection

The **General Directorate of Civil Protection**, a body that is under the Spanish Ministry of Interior, has as mission the physical protection of citizens and of goods, in the situation of a collective serious risk, public calamity or extraordinary catastrophe, in which the safety and the life of people might be in danger and succumb massively.

<http://www.proteccioncivil.org/index.html>

The **National Institute of Geography** is under the Ministry of Promotion aims at the study of geodesy, seismologia, gravimetria and geomagnetics. The main tasks of Institute are the collection and processing of seismological-geophysical parameters, the performance of research projects, the elaboration of relevant studies, the training and services to third bodies.

<http://www.geo.ign.es>

The **Ebre Observatory** is located in Roquetes, Baix Ebre. It was founded by the Jesuit Society in 1904 and since then it has been devoted to the study of the physical phenomena of the Sun-Earth interaction. It was one of the first observatories that focused the subject.

<http://www.readysoft.es/observebre/7index.htm>

## 4. International organisation policy

This chapter intends to make a short presentation of the policy that is followed by international organisations in the field of seismic disaster prevention and mitigation and earthquake emergencies.

### 4.1 Council of Europe

The major natural and technological disasters are a main concern for citizens and governments. The Committee of Ministers of the Council of Europe has set up the Open Partial Agreement in 1987. This intergovernmental Agreement, the so called EUR-OPA Major Hazards Agreement is a platform for co-operation in the field of major natural and technological disasters between Eastern Europe, the South of the Mediterranean and Western Europe concerning knowledge, prevention, risk management, post-crisis analysis and rehabilitation.

One of the main points of EUR-OPA Major Hazards Agreement is to have sought to ensure a direct interest and participation of the member States by fostering the creation of European Centres. The European Centres consist the **Network of Specialized Euro-Mediterranean Centres**. These structures facilitate a concrete contribution from the different partners, with common objectives, through the implementation of European information, training and research.

[http://www.coe.int/T/E/Cultural\\_Co-operation/Disasters/Activities/Network\\_of\\_Specialized\\_Euro-Mediterranean\\_Centres](http://www.coe.int/T/E/Cultural_Co-operation/Disasters/Activities/Network_of_Specialized_Euro-Mediterranean_Centres)

The European Centres that are mainly involved into the study of earthquake disasters, the problems that arise and the seismic risk management are:

#### **1. European Centre on Prevention and Forecasting Earthquakes, Athens, Greece.**

The European Centre on the prevention and forecasting of earthquakes is a non-profit organisation that operates within the framework of EUR-OPA Major Hazard Agreement which was ratified by the Greek Law in 1992.

The main objective of the European Centre on the prevention and forecasting of earthquakes is to do research on the prediction of earthquakes, minimising casualties and damage, and civilian training.

#### **2. Euro-Mediterranean Centre on Evaluation and Prevention of Sismic Risk, Rabat, Morocco**

Created in December 1995, CEPRIS main aim is to develop a unified strategy and common framework for co-coordinating and correlating activities relating to regional seismotectonic zoning and assessment of seismic hazards and risks in the Mediterranean region.

#### **3. European Centre for Geodynamics and Seismology, Luxemburg**

The main objectives of ECGS, which was established in June 1988, are to develop the European research and training programmes on the physics and dynamics of solid earth and on the instrumental techniques for the measurement of ground deformation. The teaching activities (Journées Luxembourgeoises de Géodynamique, workshops and scholarships) as well as the research activities will be continued along these lines in 2002.

#### **4. European Mediterranean Seismological Centre, Bruyères-le-Châtel, France**

Founded in 1975 on a recommendation by the European Seismological Commission, the Centre has consisted since 1993 of an Assembly, a Co-ordination Bureau (President, first Vice-President and Secretary General), an Executive Council (President, Vice-Presidents, Secretary General and three elected members) and two advisory committees.

The EMSC has set up an operational alert system triggering to any earthquake whose magnitude is greater than 5.0 over the European-Mediterranean region. The EMSC maintains a 24h/24 and 7d/7 operational activity under the control of the engineer on duty. About 30 seismological station networks are contributing, in quasi-real time, parametric data related to seismic activity to the EMSC alert system. The EMSC location and magnitude are released in an alert message sent to appropriate authorities, international organisations, EMSC members and non members.

The **European Advisory Evaluation Committee for Earthquake Prediction (EAECEP)** was set up by the Committee of Ministers of the Council of Europe. It has been operational since 10 June 1994. It is in a position to reply to requests forwarded by the governments of member States of the EUR-OPA Major Hazards Agreement.

This Committee is responsible for giving enlightened advice on the earthquake predictions put forward by scientists. It was established in the context of the Council of Europe EUR-OPA Major Hazards Agreement in the light of the problems raised by earthquake predictions made by groups of scientists, announced directly or through the press, involving considerable potential damage and loss of life. Seismologists, aware of this kind of problem, had themselves adopted a European Code of Ethics on information relating to earthquake prediction during the International Conference organised by the Council of Europe in Strasbourg from 15-18 October 1991.

[http://www.coe.int/T/E/Cultural\\_Co-operation/Disasters/Activities/Programmes/Risk\\_Management\\_-\\_Decision\\_support/F%20-%20CECEPTT.asp#TopOfPage](http://www.coe.int/T/E/Cultural_Co-operation/Disasters/Activities/Programmes/Risk_Management_-_Decision_support/F%20-%20CECEPTT.asp#TopOfPage)

The intervention of the **European Warning System (EWS)** is limited to the dissemination of technical data on an earthquake (time, location, magnitude) as well as to a first evaluation of damages among member States and international organisations participating in the Agreement. Humanitarian aid is then ensured by the Commission of the European Union (through DG XI and ECHO) and by OCHA of the United Nations.

In fact, it provides member States in almost real time with technical data concerning the occurrence of an earthquake. The European Warning System is also used for other types of major disasters.

[http://www.coe.int/T/E/Cultural\\_Co-operation/Disasters/Activities/Programmes/Risk\\_Management\\_-\\_Decision\\_support/E%20-%20SAE.asp#TopOfPage](http://www.coe.int/T/E/Cultural_Co-operation/Disasters/Activities/Programmes/Risk_Management_-_Decision_support/E%20-%20SAE.asp#TopOfPage)

#### **4.2 International Federation of Red Cross and Red Crescent Societies**

The International Federation's programmes are grouped into four main core areas : promoting humanitarian principles and values, disaster response, disaster preparedness, and health and care in the community.

Disaster response continues to represent the largest portion of our work, with assistance to around 30 million people annually from refugees to victims of natural disasters. Moreover, the sharp increase in the number of natural disasters worldwide in recent years has prompted the Federation to devote more attention to disaster preparedness activities. These aim to make National Societies and communities more aware of the risks they face, how to reduce their vulnerability, and how to cope when disaster strikes.

The « Regional Assistance Strategy 2000-2003. Central and Eastern Europe» analyses the socio-economic and environmental situation in Central and Eastern Europe and poses the priorities and the objectives for federation assistance. Disaster response and preparedness are among the priorities for federation and federation regional assistance. Priority countries for regional assistance include those affected by earthquakes, particularly Balkan countries.

<http://www.ifrc.org/docs/rascas/csuras.asp>

The aid actions of the Federation after the earthquakes in Italy (2002), Greece (1999) and Turkey (1999, 2001, 2002, 2003) are reported on **the** the web page: <http://www.ifrc.org/where/europe.asp>

Also, the Chapter 5 of the «World Disasters Report 2002» addresses the seriousness of the seismic risk in Europe, describes certain problems and improvements of the national seismic crisis management and suggests the key factors that will reduce the risk of future earthquakes. **what are these “key factors”?**

<http://www.ifrc.org/publicat/wdr2002/chapter5.asp>

## **4.3 United Nations**

### **4.3.1 UN-HABITAT : RDMU (Risk and Disaster Management Unit)**

The mission Risk and Disaster Management Unit is to support national governments, local authorities and communities in strengthening their capacity in managing human-made and natural disasters. This applies both to the prevention and mitigation of disasters as well as the rehabilitation of Human Settlements, to create awareness among decision makers and communities on mitigation and adequate rehabilitation in human settlements and to bridge the gap between relief and development by combining the technical expertise and on-the-ground know-how of UNCHS (Habitat).

The Risk and Disaster Management Unit provides support to national governments, local authorities and communities by:

- Fielding assessment and technical advisory missions to disaster-prone countries.
- Assessing global and regional demands for support on disaster management and human settlement
- Designing, implementation and backstopping projects at national, regional and global level in collaboration with other countries and external support agencies.
- Strengthening co-ordination and networking among communities, NGOs, governments and external support organisations in performing disaster-related activities.
- Developing techniques and tools for the management of disaster prevention, mitigation and rehabilitation.

- Designing and implementing training programmes, as well as supporting training activities executed by other agencies and field projects.
- Promoting horizontal co-operation by networking institutions, experts and experience on disaster related activities in human settlements.

<http://www.unhabitat.org/programmes/rdmu>

### **4.3.2 UN-OCHA (United Nations Office for Coordination of Humanitarian Affairs)**

The mission of UN-OCHA is to mobilize and coordinate the collective efforts of the international community, in particular those of the UN system, to meet in a coherent and timely manner the needs of those exposed to human suffering and material destruction in disasters and emergencies. This involves reducing vulnerability, promoting solutions to root causes and facilitating the smooth transition from relief to rehabilitation and development.

The Field Coordination Support Section (FCSS) was established in 1996 within the Emergency Services Branch (ESB) in the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) in Geneva. The FCSS manages a number of tools that have been developed during the last decade to improve international coordination and cooperation in natural disasters and complex emergencies.

[http://www.reliefweb.int/ocha\\_ol/index.html](http://www.reliefweb.int/ocha_ol/index.html)

#### **4.3.2.1 INSARAG (International Search and Rescue Advisory Group)**

INSARAG is an inter-governmental network under the United Nations umbrella, which deals with urban search and rescue (USAR) and related disaster response issues. Its purpose is to provide a platform for information exchange, to define standards for international USAR assistance and to develop methodology for international cooperation and coordination in earthquake response. INSARAG includes earthquake-prone countries as well as traditional providers of international assistance.

<http://www.reliefweb.int/insarag/index.html>

#### **4.3.2.2 UNDAC (United Nations Disaster Assessment and Coordination)**

The UNDAC team is a stand-by team of disaster management professionals who are nominated and funded by member governments, OCHA, UNDP and operational humanitarian United Nations Agencies such as WFP, UNICEF and WHO. Upon request of a disaster-stricken country, the UNDAC team can be deployed within hours to carry out rapid assessment of priority needs and to support national Authorities and the United Nations Resident Coordinator to coordinate international relief on-site. Particularly after earthquakes the UNDAC team has to be mobilized rapidly in order to effectively coordinate the search and rescue (SAR) operation of international SAR teams together with the national authorities of the affected country.

<http://www.reliefweb.int/undac/index.html>

#### **4.3.2.3 IERCM (International Emergency Response Consultative Mechanism)**

The experiences of the IERCM, drawing together specialised networks such as the INSARAG, policy makers, emergency management practitioners, and providers of military and civil defence assets, have helped to strengthen national emergency

response capacities and develop best practices. OCHA provides the secretariat for the IERCM.

[http://www.dfid.gov.uk/Pubs/files/ocha\\_isp.pdf](http://www.dfid.gov.uk/Pubs/files/ocha_isp.pdf)

#### **4.3.2.4 Virtual OSOCC (Virtual Operations Coordination Centre)**

Virtual (simultaneous and continuous) Operations Coordination will provide an effective tool to facilitate the decision-making process at headquarters and in the field and improve the information flow between involved organizations throughout the relief operation.

<http://www.reliefweb.int/virtualosocc/login.asp>

#### **4.3.3. UNDRO (Office of the United Nations Disaster Relief Co-ordinator)**

United Nations office established in 1972 to coordinate international relief activities to countries struck by natural or other disasters. It is headed by a disaster relief coordinator who reports directly to the UN secretary-general and works closely with the United Nations Development Programme (UNDP).

[http://www.virtualref.com/uncrd/\\_sub/s287.htm](http://www.virtualref.com/uncrd/_sub/s287.htm)

UNDRO in co-operation with UNDP established the **SEISMED** project (**Co-operative Project for Seismic Risk Reduction in the Mediterranean Region**) under which a series of workshops were organised. The project aims at establishing procedures for the mitigation of earthquake disasters through the appropriate management of earthquake risk. This requires a synergetic effort among Mediterranean countries leading to the establishment of permanent regional co-operation in the development, transfer and adoption of common methods and techniques. These are organised around three main subject areas of a thematic framework namely seismic hazard assessment, vulnerability analysis and risk reduction.

Information about national policy of Mediterranean countries on mitigation and prevention of earthquake disasters is provided.

“Co-operative Project for Seismic Risk Reduction in the Mediterranean Region (RER/87/022) SEISMED. Proceedings of Workshop II on Seismic Vulnerability and Risk Assessment. Trieste 10-14 December 1990”, Office of the United Nations Disaster Relief Co-ordinator (UNDRO) and United Nations Development Programme/ Office of Project Services (UNDP / OPS), United Nations, 1991

#### **4.3.4 International Decade for Natural Disaster Reduction**

The international community launched the International Decade for Natural Disaster Reduction (IDNDR, 1990 - 1999) in order to increase awareness of the importance of disaster reduction. The experience of the Decade has prompted a major conceptual shift from disaster response to disaster reduction underscoring the crucial role of human action.

The secretariat of the International Decade for Natural Disaster Reduction (IDNDR 1990-2000), United Nations, Geneva, launched the RADIUS (Risk Assessment Tools for Diagnosis of Urban Areas against Seismic Disasters) initiative in 1996, with financial assistance from the Government of Japan. It aimed to promote worldwide activities for reduction of seismic disasters in urban areas, particularly in developing countries. Based on the experiences of the nine case studies, practical tools for earthquake damage estimation and implementation of similar projects were developed so that any earthquake-prone cities might start similar efforts as the first step of seismic risk management. A comparative study to understand urban seismic

risk in the world was also conducted. The RADIUS initiative has developed practical tools for seismic risk assessment of urban areas, raised public awareness and provided directions for the development and implementation of disaster mitigation measures.

<http://www.unisdr.org/unisdr/radiusindex.htm>

<http://www.geohaz.org/radius>

#### **4.4 World Health Organisation (WHO)**

The aim of the Department of Emergency and Humanitarian Action of the WHO is to increase the capacity and self-reliance of countries in the prevention of disasters, preparation for emergencies, mitigation of their health consequences and the creation of a synergy between emergency action and sustainable development. Interventions on the site of earthquake disasters, technical reports, organising of symposiums and supporting of publications about earthquakes and people's health are among the activities of the Department of Emergency and Humanitarian Action.

<http://www.who.int/disasters/mission.cfm>

## 5. European Union Policy

### 5.1 Communications, regulations, recommendations, reports

The European policy on prevention, mitigation and response on natural disasters and particularly on earthquakes, is based on the following documents:

- **Report of the Committee on Energy, research and Technology on the establishment of a European research area and regional planning measures for protection against earthquakes**, European Parliament, session documents, DOC\_EN\RR\244\244682, 31 January 1994.

The Committee on Energy, Research and Technology of the European Parliament considers earthquake as a major natural hazard with serious effects. Therefore, encourages coordination and co-operation in research and research policy, sets earthquake disaster prevention in seismic areas as top priority, calls the European Commission to establish international co-operation links, proposes the setting up of a European Earthquake Observatory, encourages the completion of the drafting of the European construction standards and the promotion of civilian rescue services at European level.

- **Communication to the Commission on earthquakes** / Anver Ghazi, Maria Yeroyanni, EU, European Commission, Directorate General Science, Research and Development, 1997

The aim of the Communication is to present the research projects that have been financed by European Commission and to underline the measures that have been taken in order to reduce the seismic risks. Furthermore, it describes the progress of the international co-operation and addresses the importance of intensifying the co-operation with Japan in research activities.

The protection of the civilians against catastrophes is a task that has to be distributed into national, regional and local authorities. Nevertheless, co-operation between the Member States would have more effective and rapid results.

Two major projects in the framework of the initiatives on civil protection are described. The first project is the "Multidisciplinary project for urban and emergency planning in seismic regions. The study cases of Patra and Pyrgos cities", financed by Civil Protection Unit, and the second is the publication of a practical manual that aims at the planning of the services prevention and response that should be offered by the competent authorities in an emergency that has arisen by an earthquake.

**-"Building a common approach to natural and technological risks"**, Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of Regions, 30/4/2003, version 8D, draft.

- **Eurocode 8** <http://europa.eu.int/comm/enterprise/construction/internal/guidpap/1.htm>

In 1975, the Commission of the European Community decided on an action programme in the field of construction, based on article 100 of the Treaty. The objective of the program was the elimination of technical obstacles to trade and the harmonisation of technical specifications. The structural design codes were called "EUROCODES". EUROCODES intend to provide a set of rules for the design of buildings and civil engineering works.

The EN Eurocodes will be set of standards that contain common unified calculation methods to assess the mechanical resistance of structures or parts thereof.

They will be used :

- To design of structural construction works (building and civil engineering works).
- To check their conformity with Essential Requirement n°1 - mechanical resistance, including aspects of Essential Requirement n°4 - safety in use, and a part of Essential requirement n°2 - safety in case of fire, including durability.
- To determine the performance of structural construction products (Construction product Directive).

The intended benefits and opportunities of Eurocodes are :

- To provide common design criteria and methods to fulfil the specified requirements for mechanical resistance, stability and resistance to fire, including aspects of durability and economy.
- To provide a common understanding regarding the design of structures between owners, operators and users, designers, contractors and manufacturers of construction products.
- To facilitate the exchange of construction services between Members States.
- To facilitate the marketing and use of structural components and kits in Members States.
- To facilitate the marketing and use of materials and constituent products, the properties of which enter into design calculations, in Members States,
- To be a common basis for research and development, in the construction sector.
- To allow the preparation of common design aids and software.
- To increase the competitiveness of the European civil engineering firms, contractors, designers and product manufacturers in their world-wide activities.

According to Vicente Leoz Arguelles, Head of Construction Unit, Directorate-General Enterprise, Eurocodes provide significant benefits to the Member States and the European Union, namely for: the safety of European citizens, competitiveness of EU Industry, open market, opportunities for research and innovation in the construction. He highlights the link with the Public Procurement Directive (Directive 93/37/EEC), for use of Eurocodes in Publics works, and the link with the Construction Product Directive (Directive 89/106/EEC), to determine the mechanical resistance of structural products, to be declared in the CE marking.

Eurocode 8 is one of the new Eurocodes that will eventually replace the many different design codes used in the European countries and will help to standardise design methods throughout Europe. Eurocode 8 deals with the design of all types of structure to withstand seismic loading.

A lot of research has taken place throughout Europe that provides detailed information for this code and helps to identify suitable design methods for structures that will be built in active seismic areas.

Eurocode 8 (EC8) indicates the design provisions for earthquake resistance of structural construction works. It is consisted by the following parts.

<b>Eurocode Parts</b>	<b>Contents</b>	<b>Status (has the status changed?)</b>
Pr EN 1998-1	General rules, seismic actions and rules for buildings	Achieved, comment
Pr EN 1998-2	Bridges	Running
Pr EN 1998-3	Towers, masts and chimneys	Running
Pr EN 1998-4	Silos, tanks and pipelines	First project draft received at CMC
Pr EN 1998-5	Foundations, retaining structures and geotechnical aspects	Achieved, no comment
Pr EN 1998-6	Towers, masts, chimneys	Running

<http://europa.eu.int/comm/enterprise/construction/internal/essreq/eurocodes/confer.htm>

“Report on progress on Eurocodes. To 57<sup>th</sup> SCC”, Brussels, 10 April 2003

## 5.2 Research programmes and projects

### 5.2.1 Directorate General Research

Since 1987, Directorate General Research has provided financial support for around fifty research projects in the field of earthquakes. As is the case for the other types of disasters, the emphasis is on a multi-disciplinary approach, bringing together all the necessary skills and scientific disciplines. The projects have various strategic objectives. Some aim to define methods for predicting earthquakes, and in this respect there is still much ground to cover. Other projects are working towards strengthening buildings, bridges and other types of constructions, so as to make them more resistant to shock waves.

In 1996, the Commission drew up a veritable European "battle plan" designed to ensure greater protection for citizens of the Union from the risk of earthquakes. Member States are called upon to strengthen their information and communication systems, develop international cooperation, and systematically implement Eurocodes, the anti-earthquake standards system for the construction industry.

The research areas that are defined by RTD programmes illustrate the intention of the Directorate General Research to promote scientific research on seismic hazards, development of new technologies and improvement of construction modes.

Several projects have been approved and financed by the Community Research and Development Information Society (CORDIS) under different programmes, that target on Climatology, Natural disasters and Risk

The proposals that have been submitted focus on earthquake prediction, warning systems, data infrastructure, seismology, risk evaluation, risk assessment, earthquake engineering, cultural heritage, earthquake motion studies, seismic risk scenarios, estimations of aftershocks and geophysical studies.

The Annex 2 contains a list of the individual research projects about earthquakes and the prevention of seismic disasters carried out under European Union programmes .

The results of the research projects that have been financed by Directorate General Science, Research and Development are presented in the report with the title “**Highlights of results from natural hazards research projects-1997**”, developed by the Climate and Natural Hazards Unit of DG RTD. This report summarises some

highlights of the recent results from research projects. In general, many of these results reflect scientific accomplishments worthy of providing useful information needed for decision-making and effective management. Annex 3 includes the section that is referred to the earthquakes.

Of special interest are the results of the operational seismic hazard and seismic risk mapping methodology with application to test areas in Italy and Spain was produced. It serves as a useful tool for seismic risk evaluation to help emergency plans, urban and land use planning.

<http://europa.eu.int/comm/research/envsc/hazard.pdf>

## **5.2.2 Joint Research Centre (JRC)**

The mission of the Joint Research Centre (JRC) is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of European Union policies. As a service of the European Commission, the JRC functions as a reference centre of science and technology for the Union. Close to the policymaking process, it serves the common interest of the Member States, while being independent of special interests, whether private or national.

JRC is involved in public security and risk management issues, including those associated with advances in technology, and risks from natural and technological disasters. The integrated scientific area “Technological and natural risks” is under the horizontal action “Public security and antifraud” of the JRC Work Programme 2003.

The Institutes of JRC have developed a basis for research on several fields, including earthquakes.

### **5.2.2.1 Institute for the Protection and Security of the Citizen (IPSC)**

<http://ipsc.jrc.cec.eu.int>

The Institute for the Protection and Security of the Citizen (IPSC) is one of seven institutes that constitute the European Commission's Directorate-General Joint Research Centre. IPSC provides research-based, systems-oriented support to European Union policies so as to protect the citizen against economic and technological risk.

IPSC's scientific and technological base is designed to support European Union policies related to the general theme of enhancing the security of the citizen. Participation in research, which is increasingly based on networks and collaborative projects with industry, universities, national laboratories and research organisations, forms the backbone of this base. Research in IPSC is based on three broad policy-focused themes: Anti-fraud and Compliance Monitoring; Decision Support in Economic and Technological Risk Management; and Monitoring-Proliferation and Nuclear Safeguards.

The project **Natural and Environmental Disaster Information Exchange System (NEDIES)** is conducted by IPSC and was launched to support Environment General Directorate. The main aim of the project is to provide scientific and technical assistance to Member State Civil Protection Services and Organisations involved in the management of natural and environmental disasters, and help the exchange of experiences at European level. The overall project has been split in two phases: the pilot phase and the operational phase. The pilot phase started in January 1997 and was

dedicated to the design, development and testing of the overall methodology which now is being implemented in the operational phase; the activity focused on few types of natural disasters, mainly floods and earthquakes. The operational phase of the project started in mid 1999, extending main types of natural disasters (e.g. floods, earthquakes, avalanches, landslides, forest fires) and considering also environmental disasters. The project deals with disasters of significant interest for the Member States.

[1999 Annual report Bulletin](#)

A main NEDIES activity is to produce “lessons learnt” reports on experience gained from the past disasters. Lessons learnt from earthquake disasters that occurred in Greece are discussed on a report named “**Lessons Learnt from Earthquake Disasters that Occurred in Greece**”.

<http://nedies.jrc.it/doc/Earthquakes%20Report%20with%20logo.pdf>

#### **5.2.2.2 European Laboratory for Structural Assessment (ELSA)**

<http://elsa.jrc.it>

The European Laboratory for Structural Assessment (ELSA) is part of the Institute for the Protection and Security of the Citizen (IPSC). In ELSA is studied safety aspects related to consequences of natural and man made hazards on structures. These structures are buildings, bridges, means of transport, and cultural heritage.

The two main facilities of ELSA, the Reaction Wall facilities and the Large Dynamic Test Facility (LDTF), are unique facilities in Europe.

The following project have been carried by ELSA :

- **SEISPRO** : Seismic Protection of Civil and Cultural Heritage Structures
- **COSISMO** : Comportamento Sísmico de Monumentos (Seismic behaviour of Monuments)
- **ISTECH** : Development of Innovative Techniques for the Improvement of Stability of Cultural Heritage, in particular Seismic Protection
- **SAFERR** : Safety Assessment for Earthquake Risk Reduction

<http://elsa.jrc.it/projects/index.htm>

A workshop on “**Characterisation of Vulnerability of Buildings**” organized by the EUR-OPA Major Hazard of the Council of Europe. Held in Ispra, Italy, at the ELSA, from Monday 3 to Wednesday 5 March, 2003. The workshop was attended by about 30 specialists invited by the Council of Europe that agreed on the need for systematic understanding of building types in Europe, dissemination of information in relation to natural hazard mitigation and experimental results related to behaviour of structures, and use of information technology in research.

[http://elsa.jrc.it/cgi/home\\_gx?type=FLD&IDselected=ELSASITE00000000000004FF](http://elsa.jrc.it/cgi/home_gx?type=FLD&IDselected=ELSASITE00000000000004FF)

**European Consortium of Laboratories for Earthquake and Dynamic Experimental Research (ECOLEADER)** is a consortium of European infrastructures for earthquake and dynamic testing financed by the European Commission under the Improving Human Potential (IHP) Programme that gives access to ELSA facilities.. The laboratories of the consortium include the ELSA reaction-wall and 4 shaking-table laboratories with complementary characteristics and co-ordination. ECOLEADER aims at giving access to the different laboratories in the framework of the Improving Human Potential programme - Access to Research Infrastructures.

<http://elsa.jrc.it/ecoleader/index.htm>

In addition ELSA produces documents related to real earthquakes. A example of such a document is the one referred to Molise earthquake that is titled : “The Molise

(Italy) earthquakes of 31 October and 1 November 2002: Report and Analysis from a field mission”, report, 2003, (EUR 20664EN).

[http://elsa.jrc.it/cgi/entity.gx/?entity.object/ELASITE000000000000568/&entity.name/Molise\\_ELSA.pdf](http://elsa.jrc.it/cgi/entity.gx/?entity.object/ELASITE000000000000568/&entity.name/Molise_ELSA.pdf)

### 5.2.3 Directorate General Information Society

A variety of IT and communication tools and application for civil protection administration has been developed by the Information Society General Directory. Those tools and applications formed the core of the 2<sup>nd</sup> CLIFF workshop with the title « IT and Communication Tools and Application for Civil Protection Administration, current status and medium term perspective» that held in Brussels on 25 June 2002. <http://styx.esrin.esa.it/cliff/workshopII.html>

One of the applications developed by Information Society General Directory that is of special interest regarding rescue activities in the case of an disastrous earthquake is **Low Cost Catastrophic Event Capturing (LOCATEC)**. LOCATEC provides the rescue teams quickly and cost-effectively reliable information primarily on the presence of people in each closed space of the building during its collapse. In addition, the LOCATEC system could give useful information on the state of the ruins in terms of possible pathways, integrity of structural elements etc and the number, state and position of people in the ruins.

The goals of LOCATEC are to:

- Enhance significantly the effectiveness of the rescue management and operations by providing a tool to perform a quick survey of the disaster site to detect and locate trapped people, plan the subsequent rescue operations in the quickest and most effective way.
- Allow, as part of an overall emergency response system, personnel, equipment and information to be dispatched where it is most needed and assist in setting rescue priorities and planning the rescue effort quickly and efficiently.
- Provide valuable information on the mechanism of the collapse process contributing in identifying the causes of the collapse, identifying possible responsibilities, applying better regulations and building safer buildings.

<http://styx.esrin.esa.it/cliff/WS2/DELPRATO-LOCATEC.ppt>

#### **Geowarn - Geospatial warning system, 1999-2002** <http://www.geowarn.org>

Quiescent but active volcanoes in regions of high geodynamic unrest represent a severe hazard and risk potential and require integrated monitoring, satellite surveying and modelling. Monitored geodetic, seismic and geochemical data together with satellite images will be transferred and unified in a coherent way to allow integration into a geo-spatial information system (GIS). An interactive and user-friendly multimedia tool will then be introduced as platform encompassing a workflow of graphical 2 to 4D landscape models and all monitored data. Hazard and scenario modelling in space and time will be achieved within the CD-ROM based multimedia platform. An early-warning system and emergency plan, applicable to other volcanic areas and educational video spots will be delivered to generate public awareness. A quick reference manual serves for trouble shooting and quality assurance. The volcanic island of Nisyros (South Aegean Sea), that suffered a seismic crisis between 1996 and 1998 is seen as a unique example to accomplish the multi-parametric data set. The Nisyros case will then be compared with the quiescent, active volcanoes of Vesuvius and the Phlegrean fields in Italy.

### **5.3 Civil Protection Unit / Directorate General Environment**

- **6<sup>th</sup> Environmental Programme and earthquakes** (it would be interesting to find out what the objectives of the programme are and what are the areas of research or implementation that are encouraged)

#### **5.3.1 The role of the Civil Protection Unit**

The European Union's various civil protection cooperation strategies are not designed to replace national systems. All initiatives are firmly based on the guiding European Union principle of subsidiarity, which states that actions in the Union should always be taken at the most local level possible.

National, regional and local expertise lies at the heart of all of Europe's disaster response initiatives and will always do so.

What the Community sets out to do is to play a coordinating role between civil protection experts in the Union's 15 Member States, the 13 candidate countries currently applying for European Union membership and the three European Economic Area (EEA) countries. Many civil protection initiatives have also been extended to countries in North Africa and parts of the Middle East in the framework of the Euro-Med project.

In emergency situations, the Community approach ensures that the best personnel are dispatched to disaster areas as quickly as possible. At other times, it allows civil protection professionals from across Europe to meet regularly, exchange views and learn from one another's best practices. The approach has allowed the Community to develop some of the world's best disaster-response strategies.

More specifically, Community cooperation in the field of civil protection has the following objectives:

- To support and supplement efforts at national, regional and local levels to prevent disasters and, if they happen, to help those responsible for civil protection and intervention to be better prepared.
- To contribute to public information so that European citizens are better able to protect themselves.
- To establish a framework for effective and rapid cooperation between national civil protection services when mutual assistance is needed.
- To enhance the coherence of actions undertaken at international level in the field of civil protection, especially in the context of cooperation with the central and east European candidate countries and with Malta, Cyprus and Turkey, in view of enlargement.

#### **5.3.2 Civil Protection Unit and earthquakes**

On 22<sup>nd</sup> September 1993, Ms Fausta Corda, representative of the Civil Protection Unit in the « Post earthquake emergency damage and usability assessment of buildings » international seminar, stated that "the Commission would be pleased to see the initiative extended to problems regarding the resistance of bridges, dikes and any other structures which could be damaged by an earthquake". Ten years later, the

activities of the JRC Institutes and other Directorates General have filled a large part of the gap in this area. Nevertheless, there is room for further action

The projects and actions that have been financed or supported by the Civil Protection Unit are:

(<http://europa.eu.int/comm/environment/civil/prote/cpactiv/cpact08.htm#Useful%20links>):

- **« Post earthquake emergency damage and usability assessment of buildings »**, international seminar, 22 - 24 September 1993, proceedings, edited by S.A. Anagnostopoulos, financed by Civil Protection Unit –European Commission and the Earthquake Planning and Protection Organisation, 1994

The subject that was addressed in the seminar was the technical, logistic and legal problems associated with the post-earthquake assessment of damaged buildings under the conditions of emergency. The seminar was co-funded by the Civil Protection Department of the European Commission and the Greek Earthquake Planning and Protection Organisation (E.P.P.O.). It has been organised by E.P.P.O. and supported by the Greek Ministry of Environment, Land Use and Public Works. It is addressed primarily to engineers working in the public or private sector, who may be involved in such an operation. The seminar led to a base on which the PEADAB pilot project was developed. A pilot project on «Post Earthquake Assessment of Building Safety » was conducted in 1995-96 as a follow-up of the seminar.

The proceedings of the seminar were edited by S.A. Anagnostopoulos, Klidarithmos, Athens 1994.

- **Post Earthquake Emergency Assessment of Building Safety (PEADAB)**, 1995-96, pilot project.

PEADAB is a computer system to support the setting up and carrying out efficiently an operation of post-earthquake emergency building inspections in populated areas stricken by damaging earthquakes. These inspections will identify which buildings are safe for immediate use or occupancy, which buildings are unsafe so that people will be kept from using them, and also which buildings need emergency intervention (removal of local hazard, support or demolition). In addition, the data that will be fed into the system during the operation can be further used for special studies and research beyond the scope of the emergency operation. For this purpose, the flexibility to change the output data format has been provided to allow easy use of the data by other programs.

- **« A multidisciplinary project for urban and emergency planning in seismic regions, The case of Pyrgos City (W. Peloponnese Greece) »**, November 1996, pilot project.

The project was conducted by the Department of Geology, University of Athens. Its objectives are :

1. The Presentation of the necessary elements for long and short term seismic risk assessment for the study area.

2. The development of an organisation plan appropriate for emergencies, considering the seismo-tectonic characteristics of the area, the particular urban planning and land planning conditions of Pyrgos city and the administrative framework and potential means of the local authorities.

- **« A multidisciplinary project for urban and emergency planning in seismic regions, Guidelines for upgrading earthquakes emergency planning in**

**Patras city. Organisational and urban planning aspects** », Earthquake Planning and Protection Organisation, Athens, October 1998

- **« Earthquake Emergency Management. Lisbon »**, I.Pais, P.T.Costa, C.S.Oliveira, J.T.Cabral, sponsored by the Civil Protection Unit - European Commission, National Service for Civil Protection, Civil Protection Department of Lisbon City Council, Bonança Insurance Company, 1996

Created in 1996, this CD-ROM was prepared by the Civil Protection Department, Lisbon City Council (Portugal). It is produced by ISD Limitada, in Portugal.

The CD-ROM provides information about :

- Causes of seismic phenomena and how they are studied in Portugal.
- The behavior of the city of Lisbon during a seismic event, by developing an earthquake scenario.
- Actions to take before, during and after an earthquake
- Information concerning major earthquake events in Portugal and all over the world.
- Information about earthquake research and prevention.

- **"Post earthquake damage and usability assessment of buildings:Further developments and applications"** (00/187 159), General Secretariat for Civil Protection and Earthquake Planning and Protection Organisation, Athens, 2003 **(the project has not finished)**. Maybe Ernst knows if the project has been cancelled or not.

- **"Mitigation of Seismic Risk- Support to Recently Affected European Cities"**, workshop, 2000. <http://www.3wcsc.jrc.it/workshop2000/index.htm#chap9>

The workshop « Mitigation of seismic risk – support to the recently affected countries » was jointly organized by the Joint Research Centre, Safety in Structural Mechanics Unit and DG-Environment, Civil Protection Unit with collaboration from DG Research, DG Enterprise, the European Consortium of Earthquake Engineering Research Infrastructures and several European Associations, institutions and experts.

The objective was to bring together the Commission Services concerned, the National Authorities and the Scientific and Technical Communities to discuss the main issues for seismic risk mitigation and to propose adequate actions to alleviate and hopefully avoid the catastrophic effects of earthquakes in Europe.

The discussion held at the end of the Workshop identified five key points for an effective mitigation of the seismic risk which can be part of a « European action plan » aiming to promote disaster mitigation efforts in Europe. These are :

1. The involvement of all the relevant institutions and organizations (European Commission, National Governments, Regional authorities, Associations, Private sector (including insurance)).
2. The importance of citizen protection from risks within the EU policies. The enlargement of the EU enhances the importance of earthquake risk mitigation since the candidate states are often earthquake prone countries (e.g. Romania, Slovenia and Turkey).
3. The focus on a list of selected topics related to Earthquake risk mitigation for which further action/development have been identified.
4. The need of a EU-based platform for formal co-operation between National Earthquake mitigation agencies and advice on the balance between the different

relevant actions required (Research, Education, Regulatory documents, Civil Protection, etc).

5. The need of increased international collaboration. Collaboration between EU, USA and Japan must be promoted and the new information technologies should be fully exploited for this goal.

Furthermore, needs for action in the field of Civil Protection were identified during the workshop. The initiative of Commissioner Wallstrom for the establishment of a Community co-ordination mechanism for Civil Protection interventions in the event of emergency, i.e. trans-national support to affected regions, etc., is welcomed.

Furthermore, the workshop suggests the imaginative promotion of public awareness on seismic risk, potentiality of interventions, etc. and a few actions for an effective role of the civil protection agencies, namely: 1) Information's collection and management (e.g. disaster scenarios including vulnerability studies, rapid prediction of post-disaster damage, etc.); 2) Periodical testing of emergency plans; 3) Training (university assistance included); 4) Full control of communications during emergency states.

### 5.3.3. MIC and response in earthquake disaster

- Ageria
- Iran

## 6. Conclusions

Earthquakes are a major natural hazard for a large part of the European Union territory. Particularly the Mediterranean countries have suffered in the past from very serious seismic disasters. Seismic disasters have been proved the deadliest of all European disasters over the past decade, and cost the continent 27 billion € in damage alone.

Some of the European Union Member States, acceding and candidate countries have a concrete policy against earthquakes and an well-organised network of agencies and research centres that is dealing with seismic risk and seismic disasters.

On the other hand, European Union has taken into consideration the seismic risk and thus significant scientific and technological achievements have been reached through various research projects, workshops, conferences and publications that have been followed and/or financed by the European Commission.

The importance of citizen protection from risks within the European Union policies is a high priority. The enlargement of the European Union enhances the importance of earthquake risk mitigation, since the acceding and the candidate states are in many cases seismic sensitive countries.

As a result, the efforts of the European Commission in the field of the mitigation and prevention of the seismic disasters have to be intensified. Until now, the European Commission played important role in supporting research activity. A future goal should be the development of further policy and the implementation of the achievements of the research projects that have been followed by the European Commission.

Policy-makers need to investigate an overall approach to co-ordination of disaster management, and lessons learnt from previous earthquakes should be collected before they are forgotten, leaving the door open for disorganised response to be repeated. The contribution of NEDIES to this direction, although it is a relatively new system with limited human resources, is extremely important. Real-time training exercises to prepare emergency teams for likely earthquake disasters would be beneficial. The economic damage and massive social disruption that earthquakes can cause calls for more awareness and understanding of the factors that increase the seismic risk.

In the future, INSPIRE (INfrastructure for SPatial InfoRmation in Europe) and GMES (Global Monitoring for Environment and Security) initiatives, as well as the "Building a common approach to natural and technological risks" Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of Regions will play an important role in policy making. Policy developed on the field of seismic protection has to take into account the provisions of the initiatives and the communication. Therefore, further studies on risk mapping and standardisation of measure scales should follow.

Co-operation with international organisations, improvement of rescue methods, land use planning and establishment of a list of institutions and organisations to whom recommendations should be addressed would be welcomed. Also, the imaginative promotion of public awareness on seismic risk and a few actions, such as information collection and management (e.g. disaster scenarios including vulnerability studies, rapid prediction of post-disaster damage, etc), periodical testing of emergency plans, training and full control of communications

during emergency states should be undertaken or followed by Civil Protection Unit of Directorate General Environment.

It would be wrong to claim that an earthquake event can be prevented, as this is physically impossible. However, it would be wise to prepare for an earthquake event. European Commission and particularly the Civil Protection Unit of Directorate General Environment have already contributed and can have further contribution to the prevention and mitigation of seismic disasters.