Preface

Eladio Fernandez-Galiano, Executive Secretary of the European and Mediterranean Major Hazards Agreement (EUR-OPA), Council of Europe

Twenty five years may not be an advanced age in the life of a person, but for an Agreement it is already the time to have proven its value and have borne fruit. Europe and the world have changed drastically in the past twenty five years. We have seen major political, technological and societal changes following the fall of the Berlin wall, two years after the signature of the European and Mediterranean Major Hazards Agreement in 1987, when the Committee of Ministers of the Council of Europe adopted on 20th March its Resolution (87) 2 "Setting up a co-operation group for the prevention of, protection against, and organisation of relief in major natural and technological disasters".

Over these past twenty five years European societies have become safer, more prosperous and democratic. The Council of Europe has grown from 21 to 47 Member States and the European Union from 12 to 27 and, what is more important, the idea of European integration has been an immense success and the values of democracy, human rights and rule of law have been further extended, overcoming the sad picture of a divided continent submerged in a sterile and dangerous "cold war".

While rejoicing in the changes in Europe, we need to recognize the intelligence and vision of the nine Council of Europe States which, long before governments were preoccupied by climate change, had at the time already understood that disaster risk reduction was to become one of the pillars of people's safety in the future.

The human loss and economic damage caused by disasters have not ceased to increase in the last years. As an example, in the 1980-89 decade, when the Agreement was signed, the insurance claims for natural disaster was 5 billion US dollars worldwide. This figure is expected to rise to around 40 billion US dollars in the 2010-2019 decade. The UN has calculated that disasters cost the world 218 billion US dollars in 2010 and 380 billion US dollars in 2011.

Disasters leave societies less able to cope with the challenges of change and development, creating a sense of insecurity. The people who started the EUR-OPA Agreement twenty five years ago understood the need to invest in prevention, to carry out works that would protect people from floods, geomorphological hazards, marine risks or technological accident. They were also conscious of the need to prepare relief well in advance of events. Just one year before the Agreement was signed, probably with the deep impact of the Chernobyl accident in minds, it had been decided to include technological hazards in its scope.

Another visionary decision of the people who prepared the EUR-OPA Agreement was to open it to the States in the neighbourhood of the Council of Europe, making it a useful instrument of cooperation when it was joined by three Mediterranean non-European States.

The Executive Secretariat wishes to present in this brochure some of the work developed over these last years, also recognising the great input, enthusiasm, expertise and sound science that the network of Specialised Centres has brought to the Agreement. We firmly believe that it has been the positive synergies between policy makers and scientists which is at the heart of the success of the Agreement.

The EUR-OPA Agreement in a nutshell

Its goals

There are no borders where the origins and effects of disasters are concerned, and "domino effects" are no respecters of territorial delimitations. For the sake of the principle of solidarity, co-operation on overall risk management needs to be well developed at both European and Euro-Mediterranean levels, especially through existing intergovernmental machinery such as that of the Council of Europe.

The European and Mediterranean Major Hazards Agreement (EUR-OPA) is a platform for cooperation between the countries of Europe and those of the southern Mediterranean in relation to major natural and technological hazards: its field of action encompasses knowledge of risks, risk prevention, emergency management and post-emergency analysis and rehabilitation.

1987★2012 years 25 ans EUR OPA
EUR-OPA MAJOR HAZARDS AGREEMENT
ACCORD EUR-OPA RISQUES MAJEURS

COUNCIL OF EUROPE CONSEIL DE L'EUROPE

Its main objectives are thus closer and more dynamic co-operation among member states from a multidisciplinary perspective, in order to ensure better prevention and protection and better organisation of relief in the event of major natural and technological disasters.

Justification for this co-operative effort stems from the need for a better sharing of knowledge about the new kinds of hazards (those associated with climate change and nuclear accidents, for instance). Another aim is to develop new methodologies and tools for efficient risk management.

The Agreement, in order to meet the major challenges posed by natural and technological hazards, takes innovative action to promote a greater risk culture within the population, as well as better management of disaster situations by all responsible authorities.

Basic facts

- Set up in 1987 by the Committee of Ministers of the Council of Europe
- Partial Agreement designated «open», as membership may be requested by any state, whether or not it is a member of the Council f Europe
- Members: 27 member states in 2012, of which 24 are members of the Council of Europe and three are from the southern Mediterranean
- Decision-taking bodies: Committee of Permanent Correspondents (and its Bureau), Meeting of Directors of Specialised Centres
- Ministerial Meetings, usually every four years, covering priority fields of action
- Specialised centres: numbering 27 in 2012

Its actors

Member states

Some countries from Europe and from the southern Mediterranean are working together to bring the subject of major hazards into a broader process of discussion of sustainable development, in conjunction with the Council of Europe's intergovernmental programme on the environment.

Member states undertake to promote co-operation between them and take care to comply with the principles and guidelines put forward by the EUR-OPA Agreement in respect of preventive action and education relating to major hazards. Thus they are expected to implement the Agreement's recommendations and resolutions through their national policies.

List of member states (in alphabetical order):
Albania, Algeria, Armenia, Azerbaijan, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, France, Georgia, Greece, Lebanon, Luxembourg, Malta, Moldova, Monaco, Morocco, Portugal, Romania, Russian Federation, San Marino, Serbia, Spain, "the former Yugoslav Republic of Macedonia", Turkey and Ukraine.

Switzerland and Japan hold an observer status.

The Agreement's specialised centres

One of the Agreement's strengths is its direct involvement of its member states through their technical bodies. It encourages the setting up of specialised centres in those countries, which provide a basis for a network of European and Mediterranean expertise. These centres make a tangible contribution to the common objectives of the Agreement by implementing information, training, research and expertise programmes in the field of major hazards. Their specific role is thus to develop national and regional projects intended to increase awareness of and resilience to major hazards among the population.

International partners

The Agreement also works in a wider context, cooperating with the United Nations International Strategy for Disaster Reduction (UNISDR) on implementation of the Hyogo Framework for Action. A co-operation memorandum was signed in 2008 by the Secretariats to promote joint initiatives in fields of common interest.

Other international organisations also take part in the work of the Agreement:
- The European Commission (through its Civil Protection Unit)
- UNESCO
- The International Civil Defence Organisation (ICDO)
- The United Nations Office for the Coordination of Humanitarian Affairs (OCHA)
- The World Health Organisation (WHO)
- The International Federation of Red Cross and Red Crescent Societies (IFRC)

The Council of Europe's Parliamentary Assembly, Congress of Local and Regional Authorities and Development Bank work very closely with the Agreement.
Since 2009 representatives and experts of the national platforms for disaster risk reduction have regularly been invited to attend the Agreement's technical meetings.

Its structure

Since it was set up, the EUR-OPA Agreement has stood out mainly for its determination to bring together those who possess knowledge (research scientists and technicians), and those who make use of that knowledge (decision-makers in the public and private sectors) in order to create a strong institutional basis for risk reduction.

A political and intergovernmental level

Guidelines for the Agreement's activities and programmes are adopted at Ministerial Meetings and meetings of the Committee of Permanent Correspondents. Held at a maximum of fouryearly intervals, each state is represented at the Ministerial Meeting by either the Minister with responsibilities in the field of major hazards or the Minister instructed by his/her government to coordinate the activity of the Ministries concerned. The latest Ministerial meeting took place in 2010 in St Petersburg (Russian Federation) and adopted the Medium Term Plan 2011-2015.

The Committee of Permanent Correspondents meets at least twice a year and each state is represented by an appointed Permanent Correspondent who, on behalf of his or her national authorities, is responsible *inter alia* for preparing for the Ministerial Meetings and monitoring medium-term guidelines' implementation through the annual programmes.

These two bodies also issue recommendations to member states on issues connected with major hazards, such as:
- role of local and regional authorities in risk reduction (2006)
- risks in coastal areas (2007),

- radiological protection of local communities: improving preparedness (2008),
- promotion of national platforms for disaster risk reduction (2009),
- reducing vulnerability in the face of climate change (2010)
- ethical principles relating to disaster risk reduction and resilience (2011)

A scientific and technical level

The network of specialised Euro-Mediterranean centres has roles in the fields of research, training and expertise with a view to implementation of the guidelines set for the Agreement in the four-year medium-term plan drawn up by the Ministerial Meeting.

In 2012, the network comprised 27 centres in 23 different countries (the full list and a short description of each is in appendix 1), and it has expertise in a wide variety of spheres, such as seismic risk (centres in Bruyères le Châtel, Skopje, Walferdange, Rabat, …), education about risks (centres in Biskra, Nicosia, Sofia, Ankara, Yerevan, …) or impact on the cultural heritage (centres in Athens, Ravello, Lisbon, …).

Each centre works, under an individual annual work programme jointly funded by the Agreement, in its own specific area of expertise. Thus a full range of expertise can be used for the purposes of coordinated programmes spanning several of the network's centres, benefiting from specific financial support from the Agreement.

In order to strengthen co-operation focusing on common subjects, specific working groups have been set up, meeting at least once a year to assess the state of knowledge in the fields concerned and to promote innovative activities in the relevant subject.

Taking stock of the past to face the future

During its 25 years of existence, the Agreement has greatly benefited from the expertise of numerous scientists and officials participating in its Specialized Centres and statutory meetings, as well as from other external experts coming from various fields who collaborated to specific projects launched by the Agreement.

In order to have a comprehensive picture of the various aspects which are dealt by the Agreement, we have asked to some of them to present in their topics of expertise both the achievements along that the last 25 years but also some insights on perspectives for the future, making clear that the wide overview presented do not intent to be exhaustive.

European Alert System for earthquakes

Rémi Bossu, Secretary General, European Mediterranean Seismological Centre (EMSC), Bruyères-le-Châtel (France)

The European Alert System is intended to improve earthquake response by promoting the provision of information and consultation between the Agreement's member states. When one of the Agreement's member states is struck by a major earthquake, the European Mediterranean Seismological Centre (EMSC) immediately informs the Council of Europe team, which brings the appropriate mechanisms into action. Since the system was set up, the information supplied by the EMSC has expanded considerably. Today, thanks to the involvement of members of the public and the development of dedicated Internet and mobile technologies, it is possible for the EMSC to provide, at least in some cases, information about the effects of an earthquake within an hour of it happening.

The EMSC, the main source of information about earthquakes in Europe and the Mediterranean

The EMSC (www.emsc-csem.org), with an average of 2 million visitors per month in 2011, is the second most popular source of seismological information on the Internet. It pinpoints 20,000 earthquakes every year, thanks to data collected in real time from around 60 partner networks monitoring seismic activity worldwide, encompassing 2 000 ground movement monitoring stations. The information that its website provides in respect of each earthquake includes, as well as location and magnitude, geographical maps, facts about past and recent seismic activity and information specifically for scientists.

The site is constantly updated. Earthquake location and a preliminary indication of magnitude are usually published within 3 to 12 minutes of the tremor. These indications are revised as new seismological data become available. Earthquakes of a magnitude greater than 5 (in the Euro-Mediterranean area), 6 (in Eurasia) or 7 (worldwide) are the subject of manual analysis round the clock, seven days a week, by a duty seismologist. This information is manually validated and disseminated within an average of 20 minutes by the earthquake notification service (ENS), via e-mail and text message to the 9 000 people who have registered with our site, or by fax for operational users. There is no charge for the ENS or for any other services offered by the EMSC. A specific service for the Council of Europe covers the countries which are members of the EUR-OPA Agreement.

Getting witnesses involved and describing earthquakes' impact

People who witness an earthquake are the first to have information and the first to be affected. By speedily collecting their on-the-spot observations, the Centre can provide critical information for the effective organisation of relief when a destructive earthquake has occurred. This is why the EMSC has, for several years now, been developing the concept of "civil seismology", whereby members of the public share their observations through dedicated Internet and mobile applications.

What actually happens is that witnesses are invited to fill in an on-line questionnaire which is available in 32 languages. Their replies are automatically translated into macroseismic intensity, on the basis of a scale in terms of local effects on persons (e.g. slight movement felt, panic…) and on buildings (extent of damage). There are several ways in which they may share their photos and videos, with related geolocation information: they can download on the site or via the RICHTER application for Android

smartphones. The photos, once validated, are published on the site. As well as showing the kind of damage caused by an earthquake, they may cast a rarely-seen light on temporary phenomena, observation of which is by definition difficult. The photo of a cliff collapsing in Greece during an earthquake (Figure 1) is one example of what is known as crowdsourcing beneficially supplementing scientific observations.

Figure 1: Collapse of a cliff caused by an earthquake (Greece). Photo supplied to the EMSC by an eyewitness. To our knowledge the only photo ever taken of this rare phenomenon.

As well as collecting in this way, the EMSC has developed an innovative approach known as "flash-sourcing", through which it obtains information about earthquakes' effects within the first few minutes. This information derives from analysis of the sudden increases in visitor numbers to the EMSC site. What happens is that, when people feel an earthquake, they rush to the Internet to try to find out what has caused the tremor that they have just experienced, leading to huge virtually instantaneous traffic increases at our seismological information site. As it is witnesses who give rise to these increases, all that is needed is to identify where they are (through their Internet Protocol addresses, which identify their machines on the network) to map the region where the earthquake has been felt.

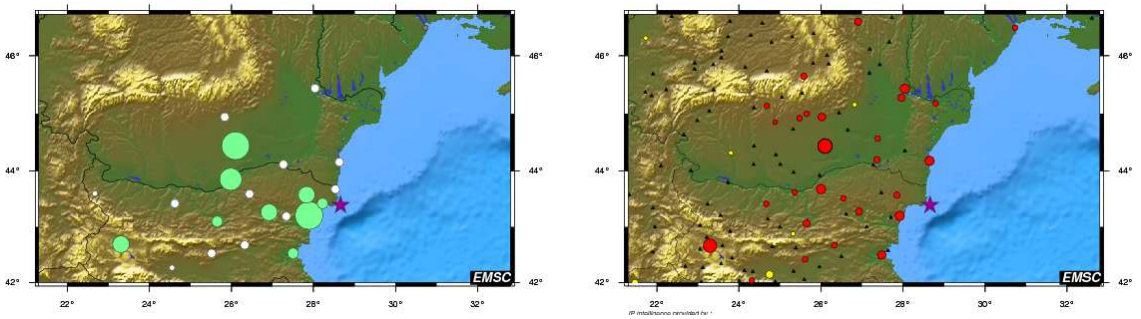


Figure 2: Macroseismic map (on the left) and map of felt areas (on the right) for the same earthquake of magnitude 4.8 in the Black Sea, the epicentre of which is indicated by a star. The macroseismic map is based on the replies to a questionnaire on the EMSC website and represents the earthquake's effects at every point, and such maps are typically available between one and two hours after an earthquake occurs. The map of felt areas is produced on the basis of an analysis of the sudden rises in visitor numbers to the EMSC site. The locations where a significant rise in visitor numbers was observed are represented in red. Such a map is available within a few minutes, before seismological networks have even located an earthquake. This is the speediest way of mapping a region where an earthquake has been felt.

The map (Figure 2) automatically generated is often available even before the monitoring networks have located the earthquake! We have, more recently, shown that damage and power cuts can be detected instantaneously through the Internet session closures

which they cause (Figure 3), since visitors to our site are suddenly cut off from the Internet. Other parameters are currently being analysed with a view to gaining more details about the effects of earthquakes. When people panic and buildings are evacuated, for example, mobile use of the Internet (via phones, tablets, etc) should be the main connection method. Ultimately, we plan automatic production within a few minutes of a map showing effects and damage, summarising all the information available (from Internet traffic analysis, questionnaires, photos, characteristics of the earthquake), followed by updating as soon as fresh information becomes available.

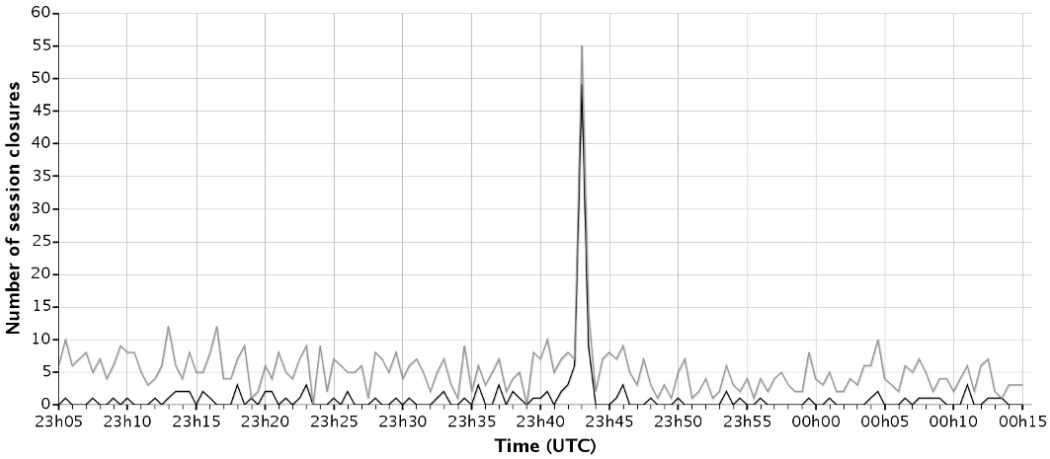


Figure 3: Power cut detection in Chile. The grey line represents the numbers of sessions on the EMSC site closed, as measured at 30-second intervals. The sudden peak at 23.43 hours corresponds to a power cut which affected one area of Chile. The black line shows the number of closures from Chile's capital city. Using this technique, it should be possible, at least in some cases, to detect and automatically and instantaneously map the areas damaged by an earthquake.

"Civil seismology" and the development of a risk culture

The magnitude and location of an earthquake are vital information for seismologists, but its significance to society is defined by its effects. In practice, a low-magnitude tremor beneath a city that wakes up thousands of people is more significant to them than a more violent earthquake which is not felt because it occurs out at sea. A knowledge of the damage caused is crucial to the efficiency of relief operations.

Rapid characterisation of the effects of earthquakes requires the involvement of witnesses. Social networks play an irreplaceable role in contacting witnesses. This is why the EMSC is currently increasing its use of Facebook, Google+, Twitter and YouTube so as to collect more eyewitness evidence and promote other forms of public involvement. In 2012, for instance, we will be deploying the first civil seismology network in Europe; volunteers' computers will be converted into seismological stations through software which will access movement measurements taken by a sensor factory-fitted to certain laptops. Looking beyond its technical aspects, "civil seismology" enables members of the public to play a part in seismological monitoring and, to some extent, in crisis management. This encourages ordinary people to grasp what is meant by seismic risk, and it enriches the dialogue between society as a whole and the scientific community, fostering the development of a risk culture.

Forecasting the consequences of earthquakes: the Extremum geo-information system

V.A. Akimov, S.A. Kachanov, T.Y. Naumova, G.M. Nigmetov, European Centre of New Technologies for the Management of Natural and Technological Major Hazards, Moscow, Russian Federation

Short-term earthquake forecasting is an area which, unfortunately, has yet to be satisfactorily addressed. Earthquakes are liable to occur suddenly in any earthquake-prone part of the globe, resulting in large numbers of fatalities and injuries.

The benefits of a rapid assessment

In order to mitigate the effects of earthquakes, scientifically proven emergency rescue operations need to be carried out, based on reliable information about the number of casualties. We know from practical experience, however, that accurate information about the effects of catastrophic earthquakes tends to emerge only three to ten days after the event or later. In the case of the catastrophic earthquake in China's Sichuan province, for example, accurate data did not become available until 30 days after the quake.

That is why the Russian Ministry of Emergency Situations commissioned the development of the Extremum geo-information system (GIS) for forecasting the consequences of earthquakes, which won first place in an international call for tenders. In the space of a few minutes, this system, drawing on operational data relating to longitude, latitude, depth and magnitude, can estimate the number of casualties, the percentage of buildings damaged, the accidents that are likely to have occurred as a result of the earthquake at critical infrastructure sites and potentially hazardous facilities, and the manpower and other resources needed to carry out rescue and humanitarian operations.

The generated data

A sample estimate of the consequences of a powerful earthquake in the Kamchatka region appears as:

Medical situation	
Population in magnitude 6 zone	376196
Total loses (people)	134085-201042
Mortality	42960-81041
Engineer situation	
Damaged buildings percentage	27
Fire number	120-1101
Domestic energy supply accidents	160-1123
Rescue works	
Rescue mechanized teams (23 people each)	100-250
Debris handling teams (7 people each)	150-500
Sanitary teams (people)	770-1010
Engineering equipment	
Heavy equipment	50-120
Dump trucks	110-250
Requirements	
Tents (58,5 sq.m)	200-300
Tents (16,5 sq.m)	2100-2700
Field kitchens	250-570

The block structure of the Extremum GIS database is :

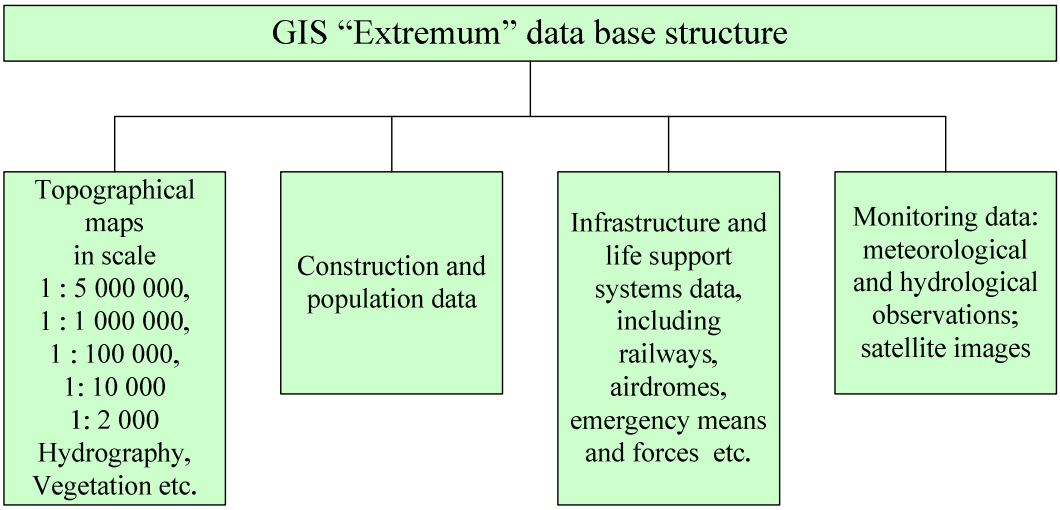
Topographic maps in the following scales: 1: 5 000 000 1: 1 000 000 1: 100 000 1: 10 000 1: 2 000 hydrography, vegetation, etc.	Demographic and building stock data for all constituent entities of the Russian Federation (RF), 2,800 administrative districts, over 300,000 population centres in the RF and 2,000,000 worldwide, vector maps for 51 towns and cities in the RF	Data relating to critical and other infrastructure, including railways; federal motorways; airfields; data relating to manpower and other resources in the event of an emergency, etc.	Monitoring data: meteorological and hydrological observations; satellite images, etc.

The Extremum system comprises the following mathematical models: seismic and secondary effects: damage to buildings and structures and human casualties; formation of rubble; optimisation of emergency rescue and other urgent measures.

A wide diffusion of the results

Following a decision by the Council of Europe, the forecasting results are transmitted to 23 countries, as well as being posted on the website of the United Nations Office for the Coordination of Humanitarian Affairs.

Every year Extremum produces forecasts of the effects of over 40 major earthquakes worldwide. The accuracy of the forecasts is greater than 70%, ensuring an effective response to destructive quakes. According to specialists, this has led to a 30% rise in the number of casualties saved.



In order to operate more effectively, the Extremum GIS system needs constant upgrading. In future, these efforts will focus on the following:

- development of the model: inclusion of foreshock and aftershock impact on buildings and structures; inclusion of the influence of local relief on seismic wave propagation; development of fragility laws for buildings and structures not included in the macroseismic scales;
- improvements to the database;
- development of the knowledge base.

Regional Mapping

Tamaz Chelidze, Director, European Centre on Geodynamical Risks of High Dams (GHHD), Tbilissi, Georgia

A challenge for development

The sustainable development of a region, and in particular of the mountainous Southern Caucasus (SC) region, depends critically on the correct assessment of natural hazards that are characteristic for this region.

The destructions, caused in the last decades by strong seismic events (Spitak, Racha, Tbilisi, Baku) and other natural hazards seriously affected national economies of SC countries. The rate of risks associated with these hazards increases every year due to the appearance of new complicated technological objects: oil and gas pipelines, communication lines, large dams, power stations, chemical factories.

One of the priorities of Hyogo Framework of Action, namely "Identify, assess and monitor disaster risks and enhance early warning", calls to "Promote regional programs including technical cooperation". The GIS technology and space images allow exact mapping of such dangers and assessing secondary effects. Exact cartography of dangers is very important for planning investments and insurance activities as well as for providing the safety to the population of the region.

A truly regional approach

In 2005 the International Bank of Reconstruction, World Bank and Columbia University compiled the set of global disaster risk maps for several types of hazards called Natural Disaster Hotspot Map (http://www.ldeo.colimbia.edu/chrr/research/hotspots/). Unfortunately, this work contains errors for the SC region, related to the natural hazards induced economic loss and mortality assessments in the region (Chelidze, 2006).

According to the Hotspot Map, the Southern Caucasus region is prone only to hydro-meteorological disasters, whereas the Northern Caucasus (NC) in subject to both Geophysical and Hydro-disasters. As the result, the mortality assessment for Southern Caucasus by Hotspot map is entirely wrong: only for the Spitak earthquake of magnitude 6.9 in 1988, victims' (25 000) exceed many times the human losses of all other kinds of disasters in the North Caucasus for centuries.

The basis of correct assessments economic losses and mortality is the reliable map of natural hazards. Below the GIS-based regional maps of the scale 1:1 000 000 for 4 hazards are presented: earthquakes (EQ), landslides, debris flows and avalanches for SC (Fig.1). The details are given in the "Atlas of GIS-based maps of Natural Multi Hazards of South Caucasus" (Ed. T. Chelidze) compiled in 2006 by specialists from Armenia, Azerbaijan and Georgia[1].

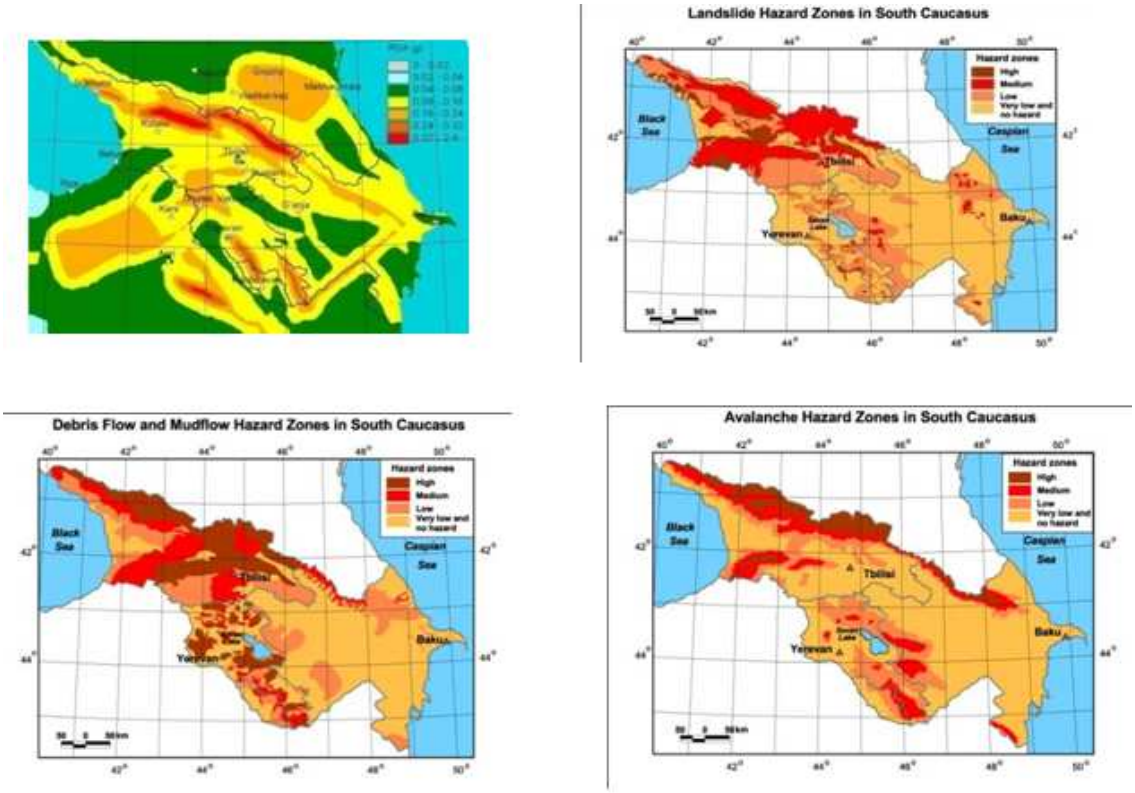


Fig1. Natural hazards' maps of the South Caucasus: a. Probabilistic seismic hazard map - Peak Ground Acceleration PGA (in g units) having 2% probability of being exceeded in 50 years; b. Landslide hazard zones; c. Debris flow and mudflow hazard zones; e. Avalanche hazard zones

It is evident that for seismic and avalanche hazard maps, the defined zones do not reflect state borders thanks to a unified assessment methodology. On the contrary, landslide and debris flow hazard zones have discontinuities on state borders due to differences in hazard's calculation techniques in different countries and thus requires a common methodology.

Implications of the study

The results obtained were discussed during the II International Workshop "GIS-based Mapping of Integrated Hazards in the Southern Caucasus as early warning tool" (Tbilisi, 27-28 November 2006). The main conclusions and recommendations of the workshop were:

- Natural hazards on the territory of SC caused in the last decades a total hazard of the order of dozens of billions US dollars and the largest damage is associated

[1] **Georgia:** Geodynamical Hazards of High Dams, M. Nodia Institute of Geophysics, Ministry of Environment Protection and Natural Resources, Seismic Monitoring Centre of Georgia, Georgian Geophysical Society; **Armenia:** GEORISK - Scientific Research CJS Company, Scientific Foundation "International Centre Garni", Institute of Geological Sciences (National Academy of Sciences), **Azerbaijan:** Institute of Geology (National Academy of Sciences), Republic Centre of Seismic Survey.

with earthquakes. New social and economic realities and climate change lead to increase the negative impact of natural disasters on the stable development of the countries of SC.

- It is clear that at present the early warning in the strict sense of the word is possible only for some specific hazards (such as tsunami, hurricanes and storms) namely, for the cases, when the source and propagation details are known exactly and timely. That is why the concept of early warning should be broadened to include the probabilistic assessment of hazard and its recurrence period. This approach allows carrying out a lot of preventive activities, which can reduce considerably the losses and casualties from catastrophes.
- The multi hazard maps of SC countries (seismic, landslides, debris flows, avalanches) on the scale 1:1000000 using GIS-technologies, as well as the corresponding data bases, were approved. These results give a strong basis for developing in the future a sound regional risk assessment of mortality and economic losses and for designing a risk reduction strategy.
- Difficult economic situation, which makes the South Caucasus extremely vulnerable to disaster impact, was pointed out and consequently requires international institutions support to the regional disaster reduction programs.
- Developing a standardized accounting of hazard events and losses for the nation and a region using GIS is of crucial importance for the development of early warning system in the broader sense. The accumulation of statistical data allows developing well-founded probabilistic (time-independent) natural hazards assessment techniques similar to well-known seismic hazard and risk assessment method.
- Creation of active non-governmental regional and national agencies that will work in systematic manner for assessing/archiving/monitoring of all catastrophic events will improve disaster resilience in Southern Caucasus.
- First steps to improve the resilience of countries of SC region to disasters are the more closely coordination of the activities in following directions:
    1. Operative exchange of data on strong earthquakes of the region with M>4 with the aim to issue preliminary location and intensity within 1-2 hours.
    2. Compilation of coordinated GIS-base natural hazards catalogue of SC region.
    3. Publication of the Atlas of Natural Disasters of Southern Caucasus.
    4. Preparation of regional programs of hazard and risk assessment and reduction for submission to International institutions.

Experiences of landslide susceptibility and hazard mapping

J.-P. Malet, O. Maquaire, J. Corominas, Th.W.J. van Asch, J.-L. Zêzere, D. Castaldini, M. Soldati, J.-C. Flageollet, M. Panizza, European Centre for Geomorphological Hazards (CERG), Strasbourg (France)

Landslides cause extensive damage to property, and occasionally result in the loss of life. It is therefore necessary to identify areas that are the most susceptible to landsliding in order to mitigate any possible damage. This analysis, known as susceptibility assessment and mapping, consists in predicting landslide spatial occurrences from a series of controlling factors. Introduction of information on landslide temporal occurrences and landslide magnitude allows to assess the hazard in reference to critical triggering events such as earthquakes, hydro-meteorological events or anthropogenic actions. The need for accurate landslide susceptibility and hazard maps has led to the development of numerous stochastic and process-based models, with increasing emphasis on the use of a GIS, remote sensing products and advanced spatial analysis tools. Three recent experiments of landslide mapping carried out by CERG at different scales (country scale, region scale, local scale), using different approaches and in different environments are presented.

Landslide susceptibility mapping at the country scale: the case of France

A 1:1M scale landslide susceptibility assessment for France, based on slope angle, lithology and land cover, has been recently proposed by CERG as part of the work carried out by the *Landslide Expert Group* of JRC (Joint Research Centre).

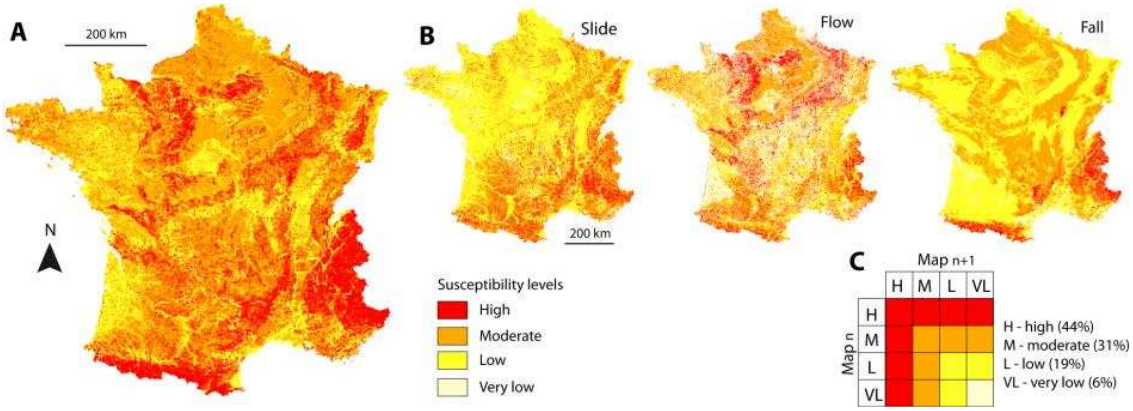


Figure 1. Differentiated tier 1 assessment over France: (A) Compound landslide susceptibility map. (B) Susceptibility maps obtained for each landslide type (e.g. slide, flow and fall). (C) Criteria used in the association method to prepare the compound susceptibility map [5].

This assessment has consisted in the development of a spatial-multi-criteria evaluation (SMCE) model able to locate the slopes the most susceptible to three categories of landslides (e.g. slides, falls and flows). Individual maps for each landslide types and a compound landslide susceptibility map have been produced (Fig. 1) by introducing expert knowledge such as the differentiation of the land in physic-geographic regions (coast, mountain, plain) [3]. The performance of the country-scale susceptibility map has been evaluated by comparisons with the spatial pattern of observed landslides (e.g. landslide inventory map) and with independent regional assessments [5].

Multi-hazard landslide and flood mapping at a regional scale: the case of the River Parano, Northern Apennines, Italy

Multi-hazard maps (landslides, torrential, processes, floods) have been proposed for several regions in Europe, and among them the Panaro Mountain (Northern Apennines, Italy), by using geomorphological approaches in reference to the method applied for the Bolzano Autonomous Province in the South Tyrol [6], which complies with the Italian law. This method, derived from [4], is based on a classification of the intensity and frequency of the events for each category of processes. This is achieved by means of univocal matrix combinations which allow the definition of various levels of geomorphological hazards (Fig. 2)

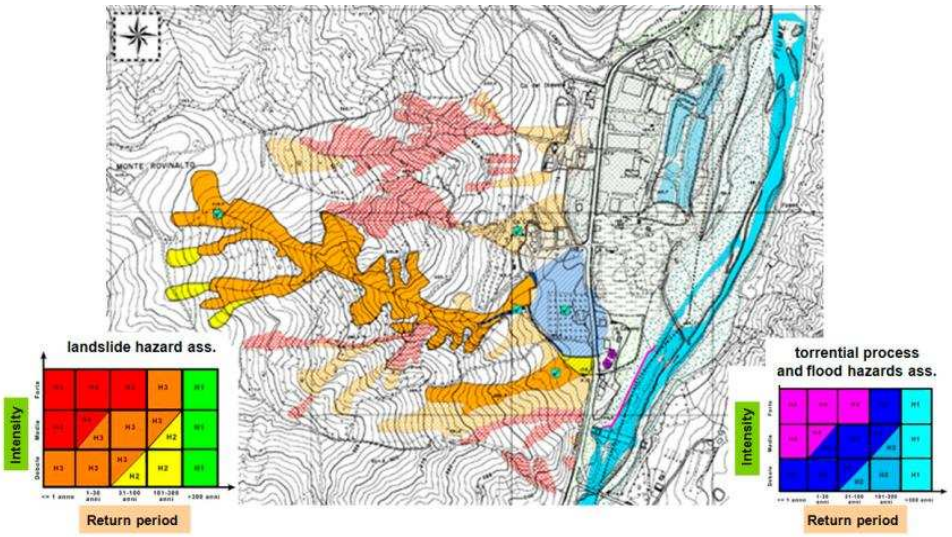


Figure 2. Example of multi-hazard map produced for the Panaro River, Northern Appenines for lansdslides, torrential processes and floods, using a matrix-orientated model to combine information on intensity and return period of the processes. Excerpt of the regional hazard map for the municipality of Casona Nord & Marano sur Parano [2]

Landslide hazard mapping at the slope scale: the case of La Valette landslide, France

For landslide mapping at the slope scale, process-based models have been used in order to simulate several landslide characteristics such as changes in pore water pressures, displacement rates, and run-out distances. In particular, a two dimensional finite difference code Mass-Mov 2D [1] for simulating the kinematics of mud and debris flows over complex terrain has been developed. It can be used to simulate the run-out and deposition of an unconfined landslide mass along a slope, or the propagation of a slurry wave along a torrent until the overflowing of the channel and the spreading of the mass on an alluvial fan. Several applications of the model have been realized for mass movements located in the Alps, in Canada, in Cuba and in India. The application of the model to estimate and map the possible extents and velocities of debris flows released from the La Valette landslide are highlighted in Fig. 3.

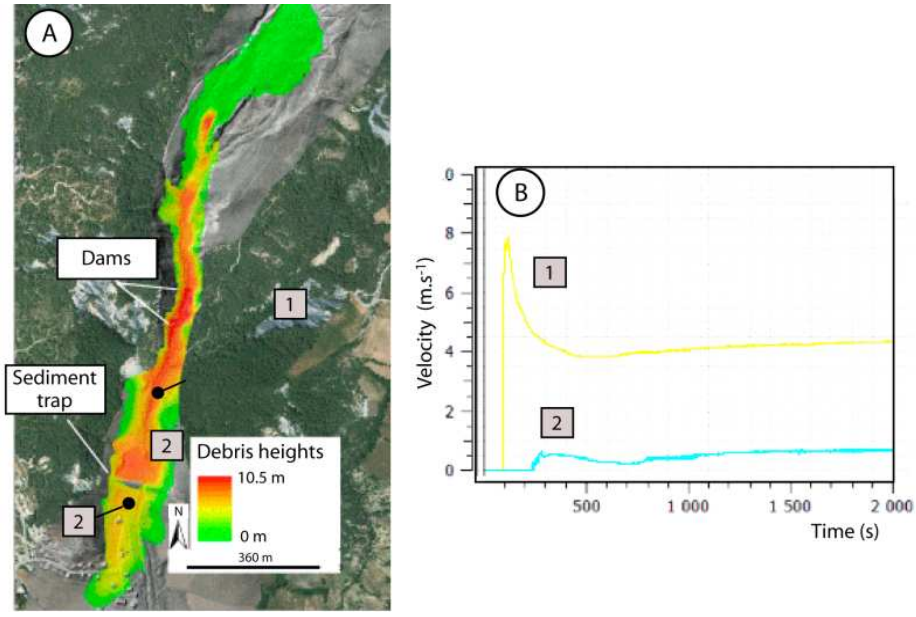


Figure 3. Process-based modelling of debris flow run-out at the La Valette landslide, South French Alps. The initial released volume is 53,000 m3; the rheology is Coulomb-viscous. (A): Simulated velocity at two locations (1,2) in the torrent stream. The effect of the sediment trap on the storage of material and on the decrease in velocity downstream in clearly observed. (B): Temporal change sin velocity simulated at the two locations. The combination of the debris flow height and velocity maps can be used to assess the hazard.

Legislation and local authorities

Monique Bernaerts, Alexandra Sonck, Higher Institute of Emergency Planning (ISPU), Brussels (Belgium)

The Higher Institute of Emergency Planning (ISPU) is seeking to structure information sharing on the legal and organisational aspects of management of the major risks specific to each EUR-OPA Agreement member state in order to facilitate transboundary co-operation in the field of major risk prevention. It is urging member states to identify good practices which have shown their worth in their country's particular circumstances or which can be presumed successful and transposable to similar situations.

The importance of local authorities

For several years the ISPU has been endeavouring, in line with the Recommendation "Local and Regional Authorities preventing Disasters and facing Emergencies" adopted by the Ministers of the Agreement in 2006 [1], to highlight the role of local and regional authorities in mitigating major risks. Work began with a wide-ranging survey aimed at Permanent Correspondents and Directors of Specialised Centres. Algeria, Armenia, Belgium, Cyprus, Croatia, Greece, Luxembourg, France and Monaco have already answered the questionnaire. Azerbaijan and Morocco are candidates to answer the questionnaire in 2012 and the ISPU wants to encourage other partner countries to participate for the period 2012-2013.

The various contributions, available on the website www.ispu.eu, were subjected to cross-analysis, which brought out certain common features and made it possible to identify schemes, practices, texts and legal procedures which have proved useful. This analysis [1], available in English and French, is primarily a working document used for preparing small workshops and exchanges of experience and good practices. It is therefore destined to evolve as contributions are added to it, providing further material for analysis and future workshops (the next one will be held in 2013).

The importance of national legislative frameworks

In an analysis of systems influenced by history, culture and a specific administrative organisation, it is not easy to bring out common features or identify good practices which are not intrinsically linked to those particular contexts. Each state has its own specific characteristics (geographical area, degree of exposure to risks, isolation of certain zones etc), and administrative set-ups also vary widely: from unitary to federal systems, with sub-state government organised around one (Luxembourg, Malta, Portugal …), two (Greece, Cyprus, Croatia, Belgium …) or even three levels (France, Spain …) appointed by the central government or elected by the population and exercising what is often a mix of local and devolved responsibilities.

Given that risk zones do not coincide with administrative divisions, the first question which might spring to mind is whether one level of authority would be more effective than another in managing major risks: the national level, which has more resources and a better overview of the country's exposure to risks, or the local authorities, which are more familiar with the characteristics of the terrain and the structure of the population living in their area?

With the benefit of the experience of the Belgian Federal Crisis Centre, of which it forms part, the ISPU took as the natural starting point for its analysis the assumption that all players are interdependent and that the coherence of the system depends on the relations that have developed between them. The authority responsible for co-ordinating situation management will have the difficult task of ensuring that the different players work together harmoniously while involving the local authorities as fully as possible and helping them to be as well prepared as possible so that, in the best-case scenario, they succeed in containing the incident and, in the worst, they at least manage the first few hours as effectively as possible.

The necessary involvement of central authorities

Unfortunately, all experience shows that the local authorities are faced with many difficulties caused, inter alia, by:

- a lack of information :What is a risk? How can I find out what effects it could have on the local area and the local population? What is the minimum content of an emergency plan? Who must be involved in drawing it up? Can I be held responsible if I make a bad decision? Etc.
- a lack of training (How should I inform the local population? How should I speak to the media? How do I go about organising an exercise? Etc.
- the fact that resources are too limited to implement the necessary actions: Who will conduct the risk analysis? Who will draft the emergency plans? What can I do to protect my emergency relief teams if the risk materialises? Etc.

The state can provide them with support and guidance in discharging their responsibilities. In this connection, the ISPU offers [2] some ideas inspired by the good practices identified. With the participation of its EUR-OPA partners (permanent correspondents and directors of centres), the ISPU hopes to add to this list and pool the methods that have made a tangible contribution to progress in risk management.

European Forum for Disaster Risk Reduction

Damir Čemerin, National Protection and Rescue Directorate, Croatia

The Special Representative of the United Nations Secretary-General for Disaster Risk Reduction, Ms Margareta Wahlström said in the introduction to the HFA Mid-Term Review:
"The Hyogo Framework for Action has been determinant in strengthening and guiding international cooperation efforts, in generating the political momentum necessary to ensure that disaster risk reduction be used as foundation for sound national and international development agendas as well as in giving a common language and a framework of critical actions to follow to which governments have clearly responded."

National Platforms in Europe

Most of the European countries have accepted HFA as a primary document defining and inciting national disaster risk reduction actions, irrespective of their earlier achievements in risk reduction and varied progress in their implementation. In addition, it has been adopted within different areas of life and work in a country. HFA has thus been a useful tool for promoting disaster risk reduction actions which enabled various stakeholders, civil and environmental protection systems (depending on decisions of a particular country) to incite or enhance their efforts in including a number of actors in disaster risk reduction.

In implementing HFA, the Global Platform has recommended establishing National Platforms for disaster risk reduction as an instrument to strengthen DRR actions and to include various actors from different areas ranging from national authorities through scientific institutions and citizens' associations to legal entities, media and religious communities. The intention was to establish disaster risk reduction as a national priority in sustainable development planning in all life and work segments, but also regarding the use of space. In addition, an important component is the inclusion of authorities at lower levels since most crucial DRR decisions are made at local level. To this day twenty European countries have established National Platforms for disaster risk reduction.

The need for international cooperation

An important segment of DRR is international cooperation which is to facilitate advancement of risk reduction process, primarily through the exchange of information and good practice, harmonization of action and also the use of other experiences that may help in establishing the National Platform for risk reduction.

During 2008 European countries began a regular information exchange through meetings of HFA Focal Points reaching an agreement at the London meeting in 2009 to establish a European institution which will link National Platforms for disaster risk reduction with representatives of HFA Focal Points. The meeting was attended by 20 countries agreeing on establishing the European Forum for Disaster Risk Reduction (EFDRR). It was organized in cooperation with and with support of UN ISDR Secretariat, Bureau for Europe and COE, EUR-OPA Agreement.

EFDRR's tasks were defined as follows:
1. The European Forum for Disaster Risk Reduction is intended to serve as a forum to stimulate and facilitate the exchange of information and knowledge among participating National HFA Focal Points and Platforms and regional/sub regional partners;
2. To provide advocacy for effective action to reduce disasters, by contributing to the implementation of the Hyogo Framework for Action 2005-2015: Building the resilience of nations and communities to disasters (HFA), and by promoting and supporting the creation of new National Platforms;
3. To create a safer Europe by reducing the impact of natural hazards to reduce vulnerability, and increasing the ability to minimize consequences of disasters;
4. The forum facilitates exchanges among European nations on the implementation of the HFA, for expanding the political space devoted to the issue and would provide an opportunity for innovative ideas in the field of DRR.

The involvement of the Agreement

Since its establishment in 1987, EUR-OPA Agreement of the Council of Europe has been tasked with promoting cooperation between member states in the field of disaster hazard reduction, or in modern terms – disaster risk reduction. However, the Agreement never succeeded in involving Council of Europe member states from the northern parts of Europe – out of 27 EUR-OPA Agreement member states none is a northern country limiting the cooperation under the Agreement to Southern and Eastern Europe, with an intense involvement of Western European Spain and France.

This is why the Council of Europe greeted the establishment of another international cooperation instrument intended to involve the whole of Europe and to gather all interested countries perceiving EFDRR as an opportunity to cooperate with other countries in the field of disaster risk reduction. EUR-OPA Agreement immediately joined the initiative providing full support for strengthening the cooperation in all of the countries thus becoming one of the Forum's founders.

The European Forum at work

So far two annual European Forum meetings have been held (in Gothenburg, Sweden in 2010 and in Skopje, Macedonia in 2011) gathering a significant number of states. Strengthening of the international cooperation has contributed to the growing number of European countries that established their DRR National Platforms. At the time of the

London meeting 14 European countries had the National Platforms officially declared, accompanied by eight representatives of HFA Focal Points. The meeting in Sweden in 2010 saw 17 National Platforms with seven HFA Focal Points and this year there were 20 National Platforms and six national Focal Points with several countries working at establishing their own National Platforms. In addition, a number of international organizations involved in disaster risk reduction participate at a regular basis in the work of the Forum which has become a disaster risk reduction hub for the exchange of information and good practice in Europe.

The Third Global Platform conference this year in Geneva gave EFDRR and other regional platforms an opportunity to present their work. Achievements and the international cooperation network in the field were highly regarded by disaster risk reduction experts who participated in formal and informal meetings during the conference. This is the best recognition of the efforts of EFDRR and EUR-OPA Agreement and proof that they are heading in right direction. The overall result should be major contribution to real disaster risk reduction in Europe.

The contribution of the Agreement to peace in Kosovo

Jean Pierre Massué, former Executive Secretary to the EUR-OPA Major Hazards Agreement (1987-2005)

From war to peace

Following the signature in June 1999 of the Kumanovo Agreement providing for the deployment of KFOR (the Kosovo Force), that force had among its tasks the conversion of the Kosovo Liberation Army (KLA) into a civilian body.

After agreement had been reached on the demilitarisation and conversion of the KLA, many combatants were awaiting a new role. In September 1999, the Special Representative of the UN Secretary-General, Bernard Kouchner, signed UNMIK Regulation 1999/8 enabling the Kosovo Protection Corps (KPC) to be set up.

This new corps was to be set up in the form of a civilian agency responsible for emergency services, and in particular for:

- providing a disaster response capability;
- conducting search and rescue operations;
- providing humanitarian assistance in isolated areas;
- assisting with de-mining; and
- contributing to rebuild infrastructure and communities.

An international cooperation effort

In February 2000, the Special Representative of the UN Secretary-General in Kosovo asked the Secretary General of the Council of Europe to participate in this process through:

- either the Council of Europe as a whole, with a view to human rights protection and on the basis of its duties and public-service mission in a democratic society;
- or the EUR-OPA Open Partial Agreement on Major Hazards, with a view to a more professional and more specialised approach to civil security.

The Agreement was thus made responsible for developing a training programme for future members of the KPC, training which began in February 2000 and continued until November 2004. This training programme was particularly intended to be both focused and standardised, thereby leading to self-sufficiency for the Kosovo Protection Corps. Providing such training was a true challenge: could what some people regarded as a "liberation army"-type military structure, while others considered it to be a "terrorist network", be transformed into a civilian body serving population groups in a spirit of peace and stability?

Training the future officers

An "international team" was immediately set up by the EUR-OPA Agreement and co-ordinated by the then Executive Secretary of the Agreement, Jean-Pierre Massué. The team comprised experts from the Agreement's member states: Algeria (M. Boubekeur), Armenia (Stepan Badalian), Bulgaria (Kolio Kolev, Dimitar Yonchev), France (Max Schvoerer, Jacques Lefèvre, Bernard Jannin), "the former Yugoslav Republic of Macedonia" (Zoran Milutinovic), Malta (Anton Micaleff), Morocco (Mustapha Denial) and Ukraine (Victor Poyarkov).

In co-operation with the International Organisation for Migration (IOM) in Kosovo, training courses were organised on the basis of the "Handbook"[2] prepared for this purpose by the international team, and at the end of the training course, the first graduates to join the Kosovo Protection Corps were awarded their certificates, with Gen Agim Çeku (later to become Prime Minister from March 2006 to December 2007) appointed the first head of the new civilian protection agency.

[2] The handbook is composed of six blocks which can be used independently:
Block 1: *"Risk and Emergency Management, Human Rights Aspects, Ethical Aspects"* by Zoran MILUTINOVIC, Skopje, Victor POYARKOV, Kiev, Antoine LAHAM from Bern, Caroline ALLIBERT, Lyon and Jean-Pierre MASSUE, Council of Europe.
Block 2: *"Natural Hazards, Technological Risks and Effects"* by Zoran MILUTINOVIC, Skopje, Victor POYARKOV, Alexander GOLUB, Oleg GAYDUK and Dmytro HORDYNSKY, Kiev.
Block 3: *"Medical Aspects of Disasters and Emergency First-Aid Provision. Epidemiology and Sanitary Action"* by Mustapha DENIAL and Mohamed NESH NASH, Rabat and Paola BIANCO, Torino.
Block 4: *"Natural Risks, Disasters and Effects. Chemical Accident Management. Protection of Cultural Heritage. New Technologies and Risk Management"* by Zoran MILUTINOVIC, Skopje, Victor POYARKOV, Kiev, Max SCHVOERER, Bordeaux, Guido SCHMUCK, European Commission and Jean-Pierre MASSUE, Council of Europe.
Block 5: *"Organization of Relief. Current Risks"* by Vijachslav HAROUTYUNYAN and Stepan BADALYAN, Yerevan and Rene CARRILLO, Montpellier.
Block 6: *"Civil Protection Training and Education - Pedagogical Aspects. Information and Education"* by Kolio KOLEV and Dimitar YONCHEV, Sofia.

Preparing our children for major hazards: "forewarned is forearmed"

Fattoum Lakhdari, Scientific and Technical Research Centre on Arid Regions (CRSTRA), Biskra (Algeria)

Over time and particularly as a result of research, knowledge, norms and techniques in the field of major hazards have increased. As a result there has been a major improvement in risk management during and after a crisis. Nevertheless, the latest disasters in the world have shown that there are still shortcomings as far as the preparation of populations is concerned. Given the frequency with which natural or technological and climate-change-related events (floods/drought) are occurring, it is now vital to ensure education and awareness raising.

Building a culture of safety

Teaching children about and making them aware of major hazards is doubly important because it makes it possible:

- to prepare them for the hazards they may face so that they can be taught to gradually adopt the appropriate responses and behaviour that may alleviate the impact of such an event and perhaps even save their life.
- children who are informed and trained can pass on the message not only to other children- at school, during holiday camps, at family meetings, etc. – but also to adults, starting with their own parents. They become the messengers of risk culture.

Fostering such a culture from childhood onwards is also a way of preparing tomorrow's adults to incorporate the notion of hazards in their everyday life: "forewarned is forearmed"

This was what motivated the education working group of the Euro-Mediterranean major hazard network, which involves several centres working in different fields (geomorphological hazards, climatic hazards, technological hazards . . .), according to their particular field of responsibility.

Taking account of local risks

To ensure that the training activities are more effective, the education and awareness raising aspect must take account of the specific nature of the hazards to which children are exposed. It must also be in keeping with the evolution of hazards and also in phase with scientific and technological developments. In every part of the world there is local savoir faire in adapting to encountering hazards; but the education of children must not be neglected.

It is obvious that children are not exposed to the same hazards in every part of the world. Education must therefore consist in raising awareness of hazards specific to the region where they live. For example in the specific case of arid and desert regions, educational activities must concern the hazards and not only the predispositional natural causes but also anthropogenic causes.

Indeed, in these environments the irrational use of natural resources gives rise to or at least increases numerous hazards such as edaphic drought, sandstorms, desertification and even floods.

Learn to respond

Raising awareness of hazards also means teaching children to respond appropriately when faced with specific risks, some of which, contrary to the generally accepted idea, are more and more frequent (floods).

This type of education is an approach which must be long-lasting in respect of certain permanent hazards in arid and desert regions. For example, in view of the recurrence of droughts, education in saving water should be part and parcel of the everyday lives of children and adults.

In the same context and regions, children are increasingly confronted with sandstorms and heat waves. They therefore need to be given appropriate training.

From local initiatives …

Every year the Centre for Scientific and Technical Research on Arid Regions Omar EL BERNAOUI (CRSTRA) holds open days as part of the National Research Week run by the DGRSDT/Ministry of Higher Education and Scientific Research. On these open days the public is invited to examine the work done by researchers, to visit the different divisions of the organisation and the experimental demonstration sites. During such visits the public, and children in particular, are made aware of the major hazards with which they might be confronted (droughts, heat waves, desertification/silting and climate changes). They are also given leaflets and CD ROMs.

The choice of tools and support material is also decisive. It is a well-known fact that in everyday life a well-illustrated book, an audio-visual message, an interactive site or a comic often commands children's attention because they are more attractive.

The project carried out by CRSTRA in 2007 and 2008 under the auspices of the EUR-OPA Major Hazards Agreement to raise children's awareness of the risks associated with climate change in the form of an interactive lesson followed by field work was welcomed by children, local authorities and civil society. An illustrated multilingual document was prepared (book and CD) and widely circulated in arid regions.

… to international efforts

In the same context, the multilingual BeSafeNet project concerning preparation for and awareness of risks, prepared by the Euro-Mediterranean network working group (CRSTRA/Algeria, CLST/Bulgaria, CERG/France, COD/Malta, CUEBC/Italy and TESEC/UKRAINE), may constitute a useful tool, given its multidisciplinary and multilingual aspects and its presentation in the form of questions and answers and its illustration.

It constitutes a practical basic tool that can be used in schools.

Indeed, schools are still the best place for teaching children about these problems by gradually incorporating the notion of major hazards into school curricula and devising practical activities in relation with the subject (role plays, simulations, preparation of guide sheets, and so on), but this does not mean that other potential partners cannot contribute to the preparation for and awareness of hazards, in particular those directly involved in dealing with hazards (members of the Civil Defence and environmental associations, for example), or by means of campaigns and travelling exhibitions run by multidisciplinary teams (scientists, educational psychologists, sociologists, field workers, etc.).

Educational exchanges between children in this field at local, national and perhaps even international level would undoubtedly help to foster a risk culture.

The Be Safe Net Initiative

George Gerosimou, European Centre for Disaster Awareness with the use of the Internet "Be safe net", Nicosia, Cyprus

The European Centre for Disaster Awareness with the use of the internet "Besafenet" Nicosia, has launched in 2004 the BE SAFE NET Website www.besafenet.net
It is elaborated in close collaboration with:

- European Centre for Risk Prevention (ECRP), Sofia, Bulgaria
- European University Centre for the Cultural Heritage (CUEBC) in Ravello, Italy
- European Centre for Seismic and Geomorphogical Hazards (CERG) in Strasbourg
- Euro-Mediterranean Centre on Insular Coastal Dynamics (ICoD), La Valletta, Malta
- European Centre of Technological Safety (TESEC), in Kiev, Ukraine
- Scientific and Technical Research Centre on Arid Regions (CRSTRA), Biskra, Algeria

Why matter about hazards?

Natural and Technological disasters cause great human and economic losses : according to the Centre for Research on the Epidemiology of Disasters (CRED), for the sole year 2008, more than 235 000 people were killed, 214 million people were affected and economic costs were over 190 billion US$.
The developing countries suffer the greatest costs when a disaster hits: they suffer more than 95% of all deaths caused by disasters and the losses due to natural disasters are 20 times greater (as a percentage of Gross Domestic Product) in developing countries than in industrialized countries (according to the World Bank).
But disasters are also a major issue for citizens of developed countries who can suffer them on their own territory (the 2009 earthquake of L'Aquila in Italy implied 308 deaths, 1500 injured and losses exceed US$16 billion) or can face it abroad due to their increased international mobility (both Sweden and Germany lost over 500 citizens each in the 2004 South East Asia tsunami).

What can we do?

We cannot prevent many of the disasters (especially those naturals) but there are certain ways to minimize the risk of disaster, in particular by distributing to all countries the best international experience. As any efficient Emergency Management relies on accurate public awareness and knowledge on hazards, risks and prevention measures, it is thus essential to increase awareness of people on :

- what types of disaster risk exist in specific areas,
- what is the nature of that risk,
- when it could happen,
- how can their consequences be minimized

This information has to be open to general public directly, also via teachers, medical doctors, local authority representatives, Civil Protection services or others. Such wish to present a common material based on sound international experience requires a pre-existing international network of expertise in the field of major natural and technological hazards and related disasters. As the Agreement has an effective network of Centres spread over its 27 member states, the material presented in the website stems from the respective expertise of those Centres. The coordination of the Initiative, the website development and its day-by-day operation is carried out by the Cyprus Civil Defence Service.

The goals of the initiative

While State Emergency Management Systems have to deal with different contexts (legal basis, capability, recourses, procedures, etc.) in each country, the behaviour of the individual, who is crucial for their survival, can mostly made abstraction of that context.
The Besafenet Initiative focuses thus on that aspect and wishes to achieve three main goals:

1. Promote a culture of safety among a new generation of people
    - Raising awareness on implications of their actions and their way of thinking on emergency
    - Replacing fear with a culture of preparedness
2. Disseminate knowledge to multilingual societies
    - Create a common knowledge base of best experience
    - Disseminate it in several languages to benefit a wider society
3. Become an interactive tool
    - Open our website to other users and organisations for their benefit and comments
    - Enrich its content by contributions based on external experiences useful information and data, such as Case studies, Lessons learnt School curriculum and also photos and videos.

But the Initiative wishes to go beyond a simple electronic textbook: using games, cartoons, animations, groups of discussions, etc., we hope to provide a friendly and interactive environment in order to interest and introduce young people to hazards and risk prevention, awareness and action in such catastrophic events.
It will thus be a powerful tool offering exchange of information and communication within countries that share a similar vulnerability to disasters, to lesser or greater extent. In addition, school children and generally young people will find a common ground to exchange views and ideas in their own language and get support either from each other, or from experts.

How can people contribute?

The particularity of the material presented in the website is to be oriented not only towards final users but also towards further diffusion through intermediaries.
As a citizen, you will have basic information on hazards and the basic actions to take both to prevent disasters and to face it when they happen.

As a teacher, you will have the capability to use additional information to spread knowledge on hazards and disasters among your pupils. In some countries, no clear cut slot is left in current curricula to such training and more traditional such as geography or physics has to be used to introduce it.
As a student, the higher level material provided can be useful for your specific training in order to include disaster reduction issue. In future, you will be professionals taking decisions and consequently influencing (even modestly) the resilience of our societies to disasters.

Forest Fires and Smoke or New Forest Fire Threats

Johann G. Goldammer, Director, Global Fire Monitoring Center (GFMC), Freiburg (Germany)

European cultural landscapes in transition: Increasing wildfire threats?

In many regions of Eurasia cultural landscapes that were formed by traditional agrarian societies over centuries are changing rapidly. The process of rural exodus and the rapidly accelerating trend of urbanization is associated with abandonment of land cultivation and thus directly or indirectly affecting cultural and wildland fire regimes. Large areas of Europe are converting to fallow lands, a process that is associated with ecological succession towards brush cover and forest, and an overall loss of open habitats. Besides the loss of valuable biodiversity the fire regimes of abandoned lands are transiting from fuel-limited to drought-driven [6], resulting in an increased wildfire hazard – a trend that is revealed by a number of extremely severe wildfires, e.g. in Southern Mediterranean Europe and the Balkans in 2007 [10], or in Western Russia in 2010 [2].

The country with the highest rate of dying villages and abandonment of agriculture is Russia. Already between 1939 and 1989 the rural population of the USSR declined from 130.2 to 97.7 million.[3] This trend is continuing. In 2010 alone more than 3,000 villages in Russia became deserted[4], a development obviously supported by government policy aimed at relocating people from rural areas and impoverished towns to larger metropolitan areas to improve living conditions.[5]

The consequences of rural exodus in temperate-boreal Eurasia on changing fire regimes have not been subject to dedicated research. Empirical observations, however, suggest that abandonment of agricultural lands, coupled with uncontrolled succession towards bush encroachment and natural reforestation, constitute an increasing wildfire hazard – at least during the transition phase to forest formation. At the same time it seems that fire is increasingly occurring – intentionally set for keeping agricultural lands open, or to dispose crop residuals, with consequences on uncontrolled wildfires spreading to surrounding vegetation including forest and peat swamps. Recent studies of agricultural burnings at global level (e.g. [5]) are revealing the magnitude of occurrence but cannot yet prove long-term changes of agricultural fire regimes in temperate-boreal Eurasia along the history and current trend of rural exodus.

The weakening or depletion of the rural work force is another factor aggravating the newly arising fire problems in these cultural landscapes in transition. Over-aging or completely abandoned village populations are leaving villages and other settlements unprotected. As it was witnessed in 2010 the risk of wildfires spreading uncontrolled into villages and the damages involved seem to become a serious problem.

Impacts of natural and contaminated vegetation fire smoke on humans

The problems and vulnerabilities of infrastructures and populations living at the interface between wildlands and fringes of residential areas or urban agglomerations, or interspersed in wildlands, have received increasing interest by the Western European

[3] Data provided by „Seventeen Moments in Soviet History": http://www.soviethistory.org/index.php
[4] See report „Exodus leaves Russia's villages to ghosts", published on 30 August 2011 by http://rt.com/news/rural-russia-dying-villages-411/
[5] See report „Russia Plans Mass Exodus", published on 17 November 2010 by http://www.nodeju.com/5449/russia-plans-mass-exodus.html

research community and led to policy response.[6] Many countries have created norms and legal instruments obliging owners of properties at wildfire risk to take precautionary / preventive measures for wildfire hazard reduction, and jurisdictions to enforce [9].

Secondary effects of wildland fire, however, have been largely neglected in the past, notably vegetation fire smoke pollution on human health and security. The episode of drought, wildfires and smoke pollution in Western Russia in July-August 2010 revealed the high vulnerability and humanitarian problems resulting from smoke emitted by burning of natural vegetation both in the rural space and through long-distance smoke transport in metropolitan areas [2]. It is likely, although not scientifically investigated due to lack of scientifically evacuated records, that the above-average (excessive) mortality of more than 55,000 people in Moscow in July/August 2010 can be attributed to the combined effects of extreme heat stress and vegetation fire smoke pollution.

Figure 1: *The city of Khabarovsk engulfed in smoke transported from vegetation fires burning in the vicinity or in neighbouring regions on 8 March 2008 – a problem recurring every couple of years (Photo: GFMC)*

Additional threats have also been largely ignored. Wildfires burning houses, infrastructures, plastic storehouses, agricultural areas with deposits of pesticides, fungicides, and fertilizers, and fires affecting landfills (residual waste) and other waste (e.g. batteries, radioactive materials) generate substantial amounts of hazardous pollutants such as dioxins [7][3]. The Frio Fire in the Pinal Mountains near in Arizona, which burned between August and October 2011 and assumedly affected an area treated by *Agent Orange* for defoliation and conversion of native chaparral to multiple land-use back in 1965, fuelled public concerns about the consequences of smoke pollution containing dioxins on human health.[7]

Vegetation fires have the potential to release toxic industrial and agricultural pollutants previously deposited in ecosystems, lifted by fire and transported with smoke particles [1].[8] In the case of pesticides and polychlorinated biphenyls, or PCBs, these persistent organic pollutants can land in regions where the compounds are now banned – or even in the Arctic, where they were never used. One of the studies looked at the long-range transport from Siberia by using satellite imaging of smoke plumes and modelling of air mass trajectories which allowed to track the source of pollutants emitted by Siberian

[6] For comprehensive literature on the wildland-urban fire research, including modeling, see: http://www2.bfrl.nist.gov/userpages/wmell/public.html#sec_publications

[7] EPA Study finds Agent Orange Dioxins in Pinal Mountains. Hazardous? You decide", published on 15 October 2011 by http://www.examiner.com/public-policy-in-mesa/epa-study-finds-agent-orange-dioxins-pinal-mountains-hazardous-you-decide and extracts in the GFMC repository http://www.fire.uni-freiburg.de/media/2011/10/news_20111015_us2.htm

[8] See also summary report "Forest fires could spread pollutants", released by www.usnews.com on 3 December 2009, available at GFMC repository: http://www.fire.uni-freiburg.de/media/2009/12/news_20091204_us2.htm.

wildland fires in 2003 and transported to the Pacific Northwest of the U.S., e.g. dieldrin and alpha-hexachlorocyclohexane (alpha-HCH).

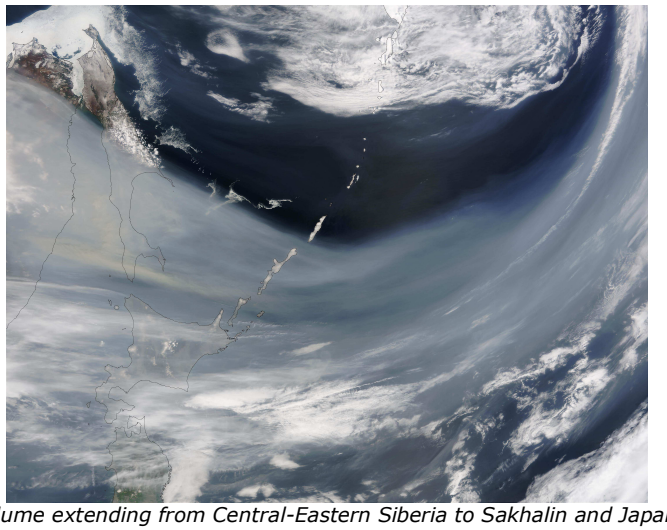


Figure 2. *Smoke plume extending from Central-Eastern Siberia to Sakhalin and Japan on 8 March 2003 (Source: MODIS instrument on the Aqua satellite; courtesy NASA / GFMC repository)*

Recent research reveals that, as a consequence of climate change, mercury deposits once protected in cold northern forests and wetlands will increasingly become exposed to burning. Mercury is released to the atmosphere with fire smoke. It is assumed that, based on on-going and projected increases in boreal wildfire activity due to climate change, atmospheric mercury emissions will increase and contribute to the anthropogenic alteration of the global mercury cycle and to the exacerbating mercury toxicities for northern food chains [8].

Fires burning on radioactively contaminated terrain

In some countries forests and other lands are contaminated by various types of hazardous chemical and radioactive pollution. Wildfires occurring in such contaminated terrain may result in secondary air pollution. The territories most affected by radioactive pollution have been contaminated by the release of radionuclides during the failure of the Reactor Number Four of the Chernobyl Nuclear Power Plant in 1986. Among the total are of 6 million ha of radioactively contaminated terrain in Ukraine, Belarus and Russia the most polluted forest area covers over 2 million ha in the Gomel and Mogilev regions of Belarus, the Kiev region of Ukraine, and the Bryansk region of the Russian Federation.

The main contaminator was found to be caesium-137 (^{137}Cs); in the core zones of contamination, strontium-90 (^{90}Sr) and plutonium-239 (^{239}Pu) were found in high concentrations. Generally, under average dry conditions, the surface fuels contaminated by radionuclides – the grass layer and the surface layer of peat lands – are consumed by fire. Most critical is the situation in peat layers, where the radionuclides are deposited. The long-range transport of radionuclides lifted in the smoke plumes of wildfires and their fallout on large areas were investigated in detail in 1992 (c.f. review by [3]). A recent study presented at the conference "Twenty-Five Years after Chernobyl Accident: Safety for the Future" (Kiev, Ukraine, 20-22 April 2011) concluded that radioactive fallout from a large forest fire occurring in the Chernobyl Exclusion Zone could affect the food chain and thus be considered threat to human health and security [4].

Response of the Council of Europe and partners

In 2006 the Directorate of Culture and Cultural and Natural Heritage commissioned a study "Vegetation Fire Smoke: Nature, Impacts and Policies to Reduce Negative

Consequences on Humans and the Environment", which was prepared in the frame of the EUR-OPA Major Hazards Agreement and authored by the European Centre for Forest Fires (ECFF), Athens, Greece, and the Global Fire Monitoring Centre (GFMC), both members of the Network of Specialised Euro-Mediterranean Centres of EUR-OPA [7].

In addition, the Council of Europe, within the Framework of the Coordinated Programmes, supported a number of activities of the GFMC to address dangerous wildfires, including problems arising from remnants of armed conflicts. In October 2009 an advanced seminar "Wildfires and Human Security: Fire Management on Terrain Contaminated by Radioactivity, Unexploded Ordnance (UXO) and Land Mines" was jointly organized with the support of the OSCE and the Environment and Security Initiative (ENVSEC) and addressed the most critical fire threats arising direct and indirect impacts from fires burning on contaminated terrain. The participants released the "*Chernobyl Resolution on Wildfires and Human Security: Challenges and Priorities for Action to address Problems of Wildfires burning on Terrain Contaminated by Radioactivity, Unexploded Ordnance (UXO) and Land Mines*" which called for action by agencies, policy makers and international organizations.[9] The wildfires and the smoke pollution episodes in Europe during the past decade, including the situation in Western Russia in 2010 during which radioactively contaminated sites and nuclear facilities had been threatened by wildfires, revealed that the threats are real and collective efforts to be taken to address dangerous wildfires.

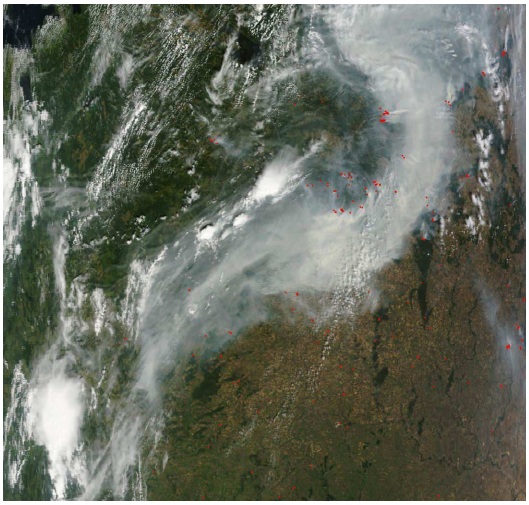


Figure 3. *Smoke plume extending from fires burning in Moscow and Nijny Novgord regions to Ukraine on 1 August 2010 (Source: MODIS instrument on the Terra satellite; courtesy NASA / GFMC repository)*

[9] http://www.fire.uni-freiburg.de/GlobalNetworks/SEEurope/SEEurope_1_radio.html

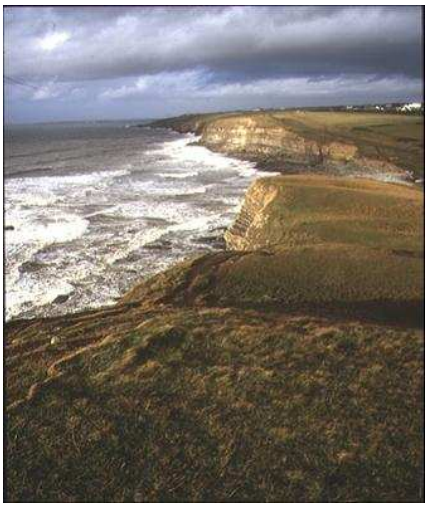
Coastal hazards and marine risks

A. Micallef, Director, Euro-Mediterranean Centre on Insular Coastal Dynamics (ICoD), La Valletta (Malta)

Hazards have been mainly classified according to their nature and origin under two main groupings i.e. natural and non-natural (i.e. technological) hazards. Within the natural hazards, one can find two sub-groups, the meteorological and geological hazards, with the former including extreme meteorological events leading to hurricanes and storm surges, floods, lightening, wind and snow storms, heat waves and drought. The geological hazards on the other hand tend to include earthquakes, volcanic eruptions, rock-falls and landslides. Human induced or technological hazards are often considered to include oil and chemical spills, erosion and flooding, radioactive contamination and dam failure.

The varied coastal environment

However for one working within the coastal and marine realm, this form of classification may appear incomplete for want of specific mention of *coastal hazards*. Several hazards are specifically manifest at the coast because of the natural confluence of many impacts accumulating in the coastal area (be they inland generated pollution or extreme precipitation events that are captured by large watersheds) or offshore meteorological phenomena resulting in hurricane winds. Similarly, Tsunamis generated largely by natural geological triggers (seismic, landslides and volcanic eruptions) impact directly on the coastal area and immediate hinterland. It may also be argued that the impact of coastal hazards is often magnified by the popularity of the coast, resulting in its increased and often unsustainable use for residential, recreational and commercial purposes. About 20% of world population (some 1,147 million people) reside within 30 km of the nearest coastline and in many small island developing states, this figure can be much higher.



In this context, people are increasingly vulnerable to coastal hazards which may result in death, injury or illness and, with respect to non-living resources, loss and damage to property and the environment. Coastal environment are also specifically prone to the influence of globally changing climate and more specifically global warming, that have resulted not only in coastal specific hazards such as sea-level rise (and associated flooding and coastal erosion) but also to the generation of increasingly extreme and

erratic events such as wind and precipitation storms often triggering landslide and flooding events. The issue with climate change is not solely limited to its generation of coastal specific hazards but also to the difficulty in determining the level of natural versus anthropogenically induced climate change occurring and thus the natural vs technological category in which to place such coastal hazards. Similarly, sea level rise is also not solely restricted to the influence of global warming but may also be determined by geological triggers such as subsidence.

What is a coastal hazard?

Since a hazard may be defined as any set of dangerous circumstances that could lead to harm / damage to living and non-living resources, a coastal hazard is one that occurs at the coast i.e. the meeting place between land and sea. The *risk* of such an event happening can be considered as the probability that it will occur as a result of exposure to a defined amount of hazard. Therefore, risk analysis is concerned with chance, consequences and context, whereas risk management is undertaken in order to reduce the adverse events identified by risk analysis.

Coastal features result largely from the interaction of land and sea and the relative intensity of a number of processes such as sea level change, erosive action of wave action and weathering, deposition of sediments by currents, and tectonic activity. The type and structure of the underlying rocks will also influence these processes. As a result, the coast is not uniform and the variety of coastal features encountered (e.g. sandy beaches, low-lying rocky shores, cliffs, clay covered coastal slopes, estuaries, mudflats, barrier reef coasts, anthropogenised coasts (e.g. seawalls, breakwaters, groins, etc.) will reflect the influence of hazard(s) encountered, the environment's exposure (e.g. to prevailing winds) and susceptibility to exposure e.g. level of human presence and the high susceptibility of particular environments e.g. that of sandy beaches to the impact of oil spills or of low-lying coastlines to sea-level rise and storm surges. There is no doubt therefore that human behaviour can invariably aggravate the risk posed by coastal hazards through in-sufficient attention to where and how settlements are built and how natural resources are exploited. An increased understanding and public awareness of coastal hazards is therefore crucial to their mitigation.

The active role of the Agreement in the field

In recognition of the importance of coastal hazards and in particular, the growing understanding and acceptance of the impact of global warming on a number of coast-related hazards, the EUR-OPA Major Hazards Agreement has, particularly but not exclusively, through its Euro-Mediterranean Centre on Insular Coastal Dynamics, ICoD, University of Malta; the European Centre for Seismic and Geomorphological Hazards, CERG, Strasbourg, France and the Specialised European Centre on Coastal Risks, CerCo, Biarritz, France) dedicated considerable effort to these hazards

Among the initiatives, we can highlight their specific review in the *BeSafeNet* website dedicated to raising a culture of hazard awareness (European Centre for Disaster Awareness with the use of the Internet, Cyprus), the training course on Coastal Hazards organised in 2010 (CerCO, Biarritz, France), the post-graduate training school in 2011 on Coastal Hazards Assessment and Risk Management by (CERG, Strasbourg, France), coastal hazards sessions in a series of biennial conferences on the Management of Coastal Recreational Resources (ICoD, Malta); research programmes that address coastal hazard identification, modelling and mapping (ICoD in collaboration with the Middle East Technical University, Turkey) and reviewing extreme meteorological events in Malta (a cooperation between the University of Malta and the Malta Meteorological Office).

It is augured that through this contribution, the EUR-OPA Major Hazards Agreement will enhance our understanding and develop awareness raising on coastal hazards.

Contributing to Resilience through ecosystem-management: the Partnership on Environment and Disaster Risk Reduction (PEDRR)

Eladio Fernandez-Galiano, Executive Secretary to the EUR-OPA Major Hazards Agreement

One of the challenges of decision makers is to prepare societies for the risks from natural hazards and the increased threats that climate change will bring in vulnerable areas. Work in prevention has been a constant a reliable way to minimise or avoid future disasters. A critical question is, however, what type of investments will be more efficient and reliable and whether to opt for "hard engineering" solutions or to try to work with nature using the resilience of ecosystems to avoid some risks.

Using nature as an ally

Floods, for instance can be controlled or avoided through the building of concrete structures, canals, dykes, etc. or by creating the wetlands that might be used as natural reservoirs, re-vegetating river basins to slow water movements and adopting a more nature-based water management. In many areas coastal risks can also be minimised by the creation or maintenance of natural ecosystems that may act as natural barriers to some risks, avoiding also a further artificialisation of the coastline.

Other risks, such as landslides, debris flow, rock flow and snow avalanches typical of mountain areas may be greatly reduced by forests or other vegetation. In many European States erosion of slopes is a source both of instability of soils and bedrock, which can become hazardous in periods of heavy rain or earth tremors, and of an increase in the speed of the water run-off, causing further erosion and a faster flooding of river plains, with the ensuing risks to people and property. A good maintenance of natural ecosystems or re-vegetated areas can play a very substantive role in reducing risks in areas subject to coastal and mountain hazards as well as in cities that might otherwise suffer higher flood risks.

A sustainable approach

One of the advantages of working with nature is that natural structures for natural risk reduction (wetlands, forests, dunes, floodplains) are easy to maintain, unlike man-made structures that often require repair because of the weathering of materials. Depending on the circumstances, engineering solutions or greener alternatives may be more appropriate and often the combined use of both may deliver a more cost efficient approach.

Wildfires, which are increasing in Europe and the Mediterranean with climate change, cause also human and economic loss on top of the possible permanent environmental damage in some regions where ecosystems are not adapted to fire regimes. In this case it is important to reduce risks by an efficient fire-fighting capability but also to prevent wildfires by a preventive management of forests, covering their inflammability, creating fire breaks and again working with nature both in the choice of species to be planted in forestry and in favouring managing approaches that reduce fire risk and also prevent fires from becoming too big to fight efficiently.

Also, in recent decades a more environment conscious public has been requesting that also disaster risk reduction work avoid damaging landscapes, interesting natural areas or valuable cultural heritage. We are seeing a greening of disaster risk reduction to which the work and ideas of The Partnership on Environment and Disaster Risk Reduction (PEDRR) has greatly contributed.

An international common initiative

PEDRR is global alliance of UN and other intergovernmental agencies, NGOs and specialised institutions[10]. Formally established in 2002, The Partnership seeks to promote and scale up implementation of ecosystems-based disaster risk reduction and ensure it is mainstreamed in development planning at global, national and local levels, in line with the Hyogo Framework for Action which it contributes to implement. It provides technical and science-based expertise and applies best practices in ecosystems-based DRR approaches. The EUR-OPA Agreement joined PEDRR in 2012 and is involved of the organisation of training in Europe, trying to promote this new, environmental friendly approach to DRR.

PEDRR is guided by its vision that improved ecosystem management for disaster risk reduction and climate change adaptation will result in resilient communities. PEDRR pools the expertise of all its partner organisations in both environment and disaster risk reduction, organises regular trainings and produces knowledge based tools that may make decision makers, managers and the public more aware of the advantages of ecosystems-based disaster risk reduction. It also advocates with governments and local and regional authorities for policy change and adoption of best practice in ecosystems-based DRR and climate change adaptation based on science, practitioners experience and indigenous knowledge.

Training remains still the strongest side in the works of PEDRR. Courses are regularly organised in a variety of countries in all continents, lead by one or several of the organisations involved in PEDRR. They comprise the promotion of a number of tools including environmental assessment, integrated risk and vulnerability assessments, spatial planning integrating disaster risk reduction, integrated ecosystem management, integrated water resources management, integrated coastal zone management, integrated fire management and community-based ecosystem and disaster risk management. All these tools are enhance both sound ecosystem management and a robust reduction of disaster risk.

[10] PEDRR is formed by United Nations International Strategy for Disaster Reduction, United Nations Development Programme, United Nations Environment Programme, United Nations University, United Nations Educational, Scientific and Cultural Organization, Council of Europe, International Union for Conservation of Nature, World Wide Fund for Nature, The Nature Conservancy, Stockholm Environment Institute, Asian Disaster Preparedness Center, ProAct Network, Global Fire Monitoring Center, Global Risk Forum.

Nuclear and Radiation Risk

Victor Poyarkov, Executive Director, European Centre of Technological Safety (TESEC), Kiev (Ukraine)

The people are suffering not only from natural disasters, which cannot be preventing, but also from technological accidents are caused by human activity. Nuclear hazard is reality of our life. In some countries 80% of electricity produce by nuclear reactors, but we do not care about that every day, only in the case of emergency. The nuclear accident at the Chernobyl reactor in 1986, who shocked the world, and the recent Fukushima accident proved that each nuclear reactor attributed nuclear hazard. The public response to both accidents requested is thus a better information and protection of the population from radiation. In that line, EUR-OPA is playing since 1997 an important role in diffusing the best international practices and knowledge on nuclear hazard for decision makers, general public and mass-media.

Collecting data and experience from past events

An International web site on Scientifically Validated Information on Chernobyl Disaster (, April 1986) has been created by the TESEC and supported by the 2002 Ministerial Session of the EUR-OPA Agreement (Bandol, France) who gathered high level representatives of national authorities from more than 25 countries.
The main aims of the website are:

- Provide to the public, European political decision makers and the scientific community through a Web site, an open access to internationally scientifically validated information regarding scientific data relating to consequences of Chernobyl accident;
- Develop and deploy an international network for permanent collection, validation and presentation of radio-monitoring data regarding consequences of Chernobyl accident;
- Promote the international collaboration on research and verification of long-term consequences of nuclear accident;
- Strengthen the scientific support for decision making in the case of new nuclear emergency.

The EUR-OPA Agreement has been a co-organizer (jointly with UN, IAEA, WHO, UNDP and the EC) of various international conferences on lessons learned from Chernobyl :
"Fifteen Years after the Chernobyl Accident: Lessons Learned" (Kiev, 2001)
"Twenty Years after the Chernobyl accident: Future Outlook" (Kiev, 2006)
"Twenty-Five Years after the Chernobyl Accident: Safety for the Future" (Kiev, 2011)
With the participation of key international decision makers, such as UN Secretary-General, UNESCO Director-General, Council of Europe Secretary-General or IAEA Director General, those conferences developing strategy for better nuclear safety and radiation protection.

Fostering a greater awareness

Following decision of conferences on better information of population on radiological hazard, EUR-OPA together with Congress of Local and Regional Authorities, UNDP and Group of Local Authorities with Nuclear Facilities in Europe (GMF) organized in 2008 the international workshop "Public authorities and civil society together for a safe European nuclear future: the role of local communities, authorities and central governments in emergency preparedness and management".

The Workshop and Task force group meeting hold in 2009 defined priorities and tools for better emergency preparedness of populations living in the areas that might be affected by an accident at a Nuclear Power Plant (NPP). This should be done by disseminating best European practices on emergency planning; co-operation between the state, local authorities and NPP operators; early warning procedures; iodine prophylaxis and other protective actions.

The public perception of Chernobyl and Fukushima nuclear accidents clear demonstrated tremendous inefficient informing of people on radiation hazards corresponded to radionuclides releases. The exposure doses in the Europe from iodine-131 of Fukushima release were less than 0.001 of exposure from natural radionuclides, like radon or potassium-41. But iodine-131 initiated a high fear of general public in many European cities. In the cases of nuclear accident many people do not trust to official information of national authorities or experts on radiological risk assessment. This fact clear revealed that there is only one way to provide for people trustful information about nuclear hazard – to give them basic knowledge on radiological hazard and build their own capability for risk assessment.

The Council of Europe and UNESCO initiated in 2011 a project to develop a book on "Nuclear Hazard, Basic Knowledge: LESSONS FROM CHERNOBYL AND FUKUSHIMA ACCIDENTS". This book is a response to nuclear hazard – providing better information and protection for people. The aim of this book is quite ambitious – to present basic knowledge on nuclear hazard acceptable and interesting for different groups of people: journalists, decision makers, students, schoolboys and others.

Preparing to potential threats

The Chernobyl accident has provided a unique opportunity for research and training on emergency response and post-accidental radiation monitoring. It is one of only a few places in the world where effective training and experience in internal and external dose assessment, sample collection and preparation, contamination mapping and decision making can be provided in real highly contaminated area. It is important to expand such experience for development of post-accident radiation monitoring techniques and decision making in a case of nuclear or radiation accident.

Since 1997 an International Summer School on post-accident radiation monitoring technique is organized annually by the European Centre of Technological Safety (TESEC). Its curriculum is designed for emergency workers, decision-makers, graduate students, university faculty, and scientist interested in emergency preparedness and response, radiation protection and risk assessment. Representatives from Austria, Bulgaria, Brazil, Canada, Japan, France, Russia, Kosovo, Hungary, Italy, Slovenia, USA and other countries had already participated in that Summer School.

Mobile Radiological Laboratories Intercomparison Measurements MORAL-12 were carried out by European Centre of Technological Safety EUR-OPA and Institute "Josef Stefan" (Ljubljana, Slovenia) under auspices of IAEA during period from September 13 to September 18, 1999. Field exercises were carried out inside Exclusion Zone. There are 75 people have been participated this Workshop. Totally, there are 19 Mobile Laboratory Teams and 24 Mobile Laboratory Units were participated Workshop activities.

In accordance with the order of Council of Europe Cabinet of Ministers (CM/Del/Dec(98)641/9.8) the report "Risk Assessment of the Consequences of the Chernobyl Accident and Counter Measure Efficiency" was prepared. It investigated risks attributed to Chernobyl exclusion zone, environmental contamination and other accident consequences.

The priorities for future activity have been defined and it had concluded that the huge experience accumulated during the mitigation of the Chernobyl accident's consequences could serve as a basis for a system of scientific back-up for decision-making in the event of nuclear and other technological accidents. The creation of such a system, based on procedures for assessing and monitoring accidents which are unified at regional and international levels, is an important task. It will be a good example of how the Chernobyl disaster, which has brought so much distress and suffering, can make a positive contribution to the development of society.

Climate change and cultural heritage

Roger Lefèvre, Emeritus Professor at the University of Paris-Est Créteil (France)

The importance of forecasting and forestalling the effects of climate change on the cultural heritage has not escaped the notice of the Council of Europe's European and Mediterranean Major Hazards Agreement, which has, for instance, constantly supported the courses and workshops on this subject organised at the European University Centre for Cultural Heritage (CUEBC), in Ravello (Italy), an ideal and effective framework for the dissemination of knowledge to students and professionals in Europe.

An added risk for societies

The effects of climate change on the built cultural heritage are not expected to stem from new kinds of risks, but more from a marked change (an accentuation or even a reduction) in the effects currently being experienced. For example, the frequency and intensity of extreme, very powerful and very sudden meteorological events (high temperatures, low temperatures, heavy precipitation, strong winds, droughts) to which the cultural heritage will be subjected are expected to increase over the forthcoming decades. On the other hand, more moderate phenomena which come about more slowly, such as the blackening or erosion of the materials (especially stone and glass) of which monuments' facades are made, which depend on both climate and pollution, are expected to decrease in future, as the expectation is that pollution itself will be reduced [1][2].

Furthermore, deterioration or loss of the cultural heritage could have negative effects on European and Mediterranean societies, because of its value as a source of identity and memory, as a component of the landscape and as a source of income and jobs from tourism, particularly cultural tourism. While the European Commission has made an effort to finance research projects on the impact of climate change on the cultural heritage, such as the "Noah's Ark" [3] and "Climate for Culture" [4] projects, the Council of Europe, for its part, has focused more on support for training and high-level communication. As early as 2008, for instance, it commissioned a detailed report entitled "Vulnerability of cultural heritage to climate change" [5].

Promoting protection measures

Since 2009, courses at masters/doctorate level have been organised every year at the CUEBC, in Ravello, on the subject of the vulnerability, management and protection of the cultural heritage in the face of climate change. The next one will be held in 2012 at the French museums' research and restoration centre at the Louvre Palace in Paris. These courses, with different titles each year, but all on matters relating to the same general area, are supplemented by practical exercises on the cultural value of objects and on impact scenarios relating to imaginary cities in a variety of climate and pollution conditions. Each is attended by around 30 students, with a dozen teachers who are the top international specialists in this field. This would all be impossible to achieve if the Council of Europe did not award grants to students from all over Europe, and sometimes even from further away, and if the CUEBC did not meet the cost of the lecturers.

The international workshop on "Climate Change and Cultural Heritage", held in Ravello in 2009, was attended by 42 participants from 17 countries and international organisations, having been organised at the initiative of the Council of Europe, UNESCO and the CUEBC. The subjects broached ranged from the possible damage to monuments' stone and stained-glass windows to historic sites and collections, from the action of salts to

biodeterioration, and from heating/air conditioning and energy issues to the problems caused by rising sea levels.

The need of a clear commitment

Participants in this workshop put forward a recommendation to the Committee of Permanent Correspondents of the EUR-OPA Major Hazards Agreement, which approved it. This recommendation to member states asks them, in the context of climate change, to evaluate the risk entailed, to identify the cultural goods at risk, to adopt emergency plans, to evaluate attenuation and adaptation measures and to promote national and international co-operation, the training of professionals and research.

The texts of the lectures and the proceedings of the Ravello workshop, including the aforementioned recommendation, have been compiled in a volume published by the CUEBC [6].

The interest shown and political and financial investment made by the Council of Europe's Major Hazards Agreement in the subject of the cultural heritage in the face of climate change are thus clear for all to see. The Council of Europe was one of the first institutions to realise the huge implications of this risk, one that is all-too-often hidden or, in contrast, excessively exaggerated. The Council of Europe has taken a reasonable, but firm, line in the interest of our shared heritage. This effort should be continued in parallel with the continuation of the problem over many decades to come.

Earthquakes and Historical Cities

Stephanos Dritsos, European Centre on Prevention and Forecasting of Earthquakes (ECPFE), Athens (Greece)

Earthquakes can be considered as one of the most frightening and destructive natural phenomena. From the past, there are many signs of this kind of "attack" as a number of historical cities around the world have been hit by strong earthquakes throughout the ages. The first reported earthquake occurred in China in 1177 BC, while the earliest known earthquakes in the Americas were in Mexico in the late 14th century and in Peru in 1471. In the European region, the oldest event for an historical city seems to be the 464 BC Sparta earthquake.

Earthquakes in the ancient Greece

The 464BC earthquake destroyed much of Sparta, a city-state of ancient Greece. The historical sources of Strabo, Pausanias, Plutarch, and Thucydides state that almost 20,000 people died and the earthquake was later estimated as 7.2 M_s magnitude. This earthquake caused a revolt of the helots, the Spartan society slave class, a fact that led to increased tensions between Sparta and its rival Athens and the cancellation of a treaty between them. This earthquake was considered as one of the key events that led to the First Peloponnesian War [1].

The 226BC earthquake took place on the island of Rhodes, Greece and involved the famous large statue in front of the harbour, the Colossus of Rhodes, one of the Seven Wonders of the Ancient World. The earthquake magnitude was estimated at 7 M_s and casualties and fatalities were numerous. At the time of the earthquake, Rhodes was one of the major trading cities of the Mediterranean Sea, along with the city of Alexandria in Egypt. According to Strabo, large portions of the city suffered significant damage including the harbour and commercial buildings, which were destroyed. The Colossus was overturned and it lay in pieces near the harbour for centuries [2].

In Athens, although historical seismic data indicate that it belongs to an area of medium seismicity, the earliest known earthquake occurred in 427 BC and caused minor damage to the Acropolis. In 1200, a stronger earthquake struck the city causing some displacement of the Parthenon columns. The temple of Hephaestus, a Doric temple built on the Hill of Agora, was hit by an earthquake during the Byzantine era. This seismic event was not strong enough to cause the collapse of the building but the southern side of the temple suffered a deformation that is still preserved today [3].

The latest strong earthquake occurred in 1999 and caused an offset of the drums of the columns of the Propylaia, which is the Acropolis gateway. This seismic event of around 5.9 M_s, but the peak ground acceleration (0.30g) was high enough to produce a rotation of the drums. It is worth noting that ancient Greek temples' survival is due to the method ancient builders used to erect columns. The seismic response of slender columns of ancient monuments involves primarily the mechanism of rocking together with some sliding between column drums (figure 1). This behaviour combined with the large height of the columns (more than 10 m tall) is proved to offer a high level of seismic resistance [4].

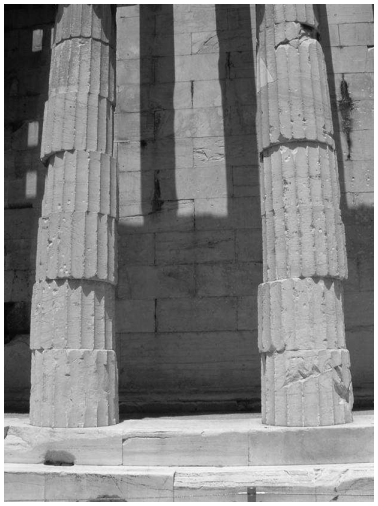


Figure 1: Rocking and sliding effects between column drums [3]

The case of Constantinople/Istanbul

Constantinople (now Istanbul) is one of the most earthquake prone historical cities of the world, where the magnificent church Hagia Sophia was constructed between 532 and 537 on the orders of the Byzantine Emperor Justinian. Within 20 years of its construction, a 6.4 M_s earthquake caused cracks in the main dome and the eastern half-dome. The main dome collapsed completely during a subsequent earthquake in 558, destroying the Ambon, altar and ciborium. The failure was mainly due to an excessive bearing load and the enormous shear load of the dome, which was too flat. These caused the deformation of the piers that supported the dome. Restoration included using lighter materials and the dome was raised by "30 feet", giving the building its current interior height of 55.6 metres. This reconstruction gave the church its present 6th century form and was completed in 562. A strong earthquake in 740 caused extensive damage, frightened citizens and lead to Eastern Orthodox Church commemoration, as every year the 26th of October is known as the day of the Great and Frightening Earthquake. After a large earthquake in 989, which ruined the main dome of Hagia Sophia, the church was repaired and reopened in 994.

The first major reported earthquake during the Ottoman period took place in 1489 and it is said to have caused some damage to the city. The 1509 earthquake was particularly strong and contemporary accounts refer to the event as "The Lesser Judgment Day" (figure 2). The earthquake had an estimated 7.2 M_s magnitude and aftershocks continued for 45 days. A hundred and nine mosques and more than a thousand dwellings were destroyed. Huge waves (tsunamis) rushing in from the Marmara Sea and crashing over the city's sea walls amplified the disaster, resulting in over 10,000 fatalities. Hagia Sophia survived almost unscathed, although a minaret collapsed. Inside, the plaster that had been used to cover up the Byzantine mosaics within the dome fell off, revealing Christian images [6], [10].

The worst earthquake to hit Constantinople, estimated at 7 M_s, took place on 1894. The effects of the tremor were felt over a radius of more than 400 km, with aftershocks following on the same day and twice again in the following week. Damage was extensive throughout the city, particularly in the historical part, where most of the population and government buildings were concentrated. Many minarets, church towers, synagogues, government offices and private dwellings crumbled or were severely damaged. A significant portion of the Grand Bazaar collapsed. The number of human casualties and fatalities was estimated as thousands [7], [8].

Other European cities

Another historical capital, Lisbon, was struck in 1755 by the so called Great Lisbon Earthquake. This earthquake was followed by fires and a tsunami, which almost totally destroyed Lisbon and adjoining areas. Seismologists today judge that it had a magnitude in the range of 8.5–9.0 M_s. Estimates place the death toll in Lisbon alone as between 10,000 and 100,000 [9].

Figure 2: 1906 Messina earthquake and tsunami [10]

The most destructive recent European earthquake and subsequent tsunami occurred in 1908 in and around the city of Messina, Italy (figure 2). The magnitude of the earthquake was 7.2 M_s, between 100,000 to 200,000 lives were lost and 91% of the buildings in the city collapsed [10].

Protect historical cities from earthquakes today and in the future

Nowadays, frameworks have been created by institutions such as UNESCO and the Council of Europe which provide measure and strategies for the protection of historical cities against earthquakes. A reasonable strategy applied in many countries includes the creation of an inventory containing documentation with the elements constituting the nation's cultural heritage, a detailed list of monuments and especially of historic and traditional structures. Subsequently, necessary measures that could be taken would include the completion of a theoretical understanding of monument structural systems, the development of rational models and the provision of education and training for engineers and technicians. The development of specifications and guidelines for assessment and upgrading, including quality assurance and effectiveness, should be considered. Finally, it would be also of great importance to reconsider the whole framework of administrative and legislative measures and the evaluation of risks to cultural heritage, which entails estimating the hazard and assessing how vulnerable each particular monument may be to the hazard. In addition, small scale emergency plans for protection and rescue should be in force, and early response reconnaissance missions should be prepared [10].

In the case of museums, several mitigation measures can be applied. One of the most commonly used for exhibits is the installation of base isolation mechanisms. This A characteristic case would be the monumental marble statue of Hermes that is at the Archaeological Museum in Olympia. The statue has been placed on a supporting platform that has a sufficient space between the edges of the platform and the protective rail that surrounds the exhibition assembly to accommodate the lateral displacement of the base isolation unit and the statue [11].

A successful strategy that has been carried out in many historical cities is the instrumentation of monuments through a national network of accelerographs. The intention is to collect specific data through time to understand the behaviour of monuments for use some time in the future so that an appropriate seismic defence can be considered.

A hopeful message from mythology …

The ancient Greeks had symbolized the earthquake as the chief of the Giants named Enkelados, who attacked and punished the people. The myth says that goddess Athena bit Egelados in a battle and imprisoned him in the Sicilian Mount Etna. This is the reason why Etna erupts from time to time, as Enkelados tries to escape.

As Athena was the goddess of wisdom and knowledge in ancient Greek mythology, the myth's message is that people shouldn't be afraid: knowledge and wisdom will win the battle with the earthquake.

Disaster Medicine Training

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Evidence is increasing that traditional approaches to disaster medicine training are no longer acceptable in the current ethical and professional context. Alternatives to "learning by doing" in a clinical context are currently available from recent developments in simulation and virtual reality.

Simulation, which includes scenarios or environments designed to closely resemble real-world situations, offers a safe environment within which learners can repeatedly practice a range of clinical skills without endangering patients. Simulation techniques have been used to teach all aspects of medical care, including knowledge, technical and non-technical skills. In addition, simulation teaching has been identified as the optimal instrument to control human factors and to prevent medical errors which heavily influence the outcome of disasters' victims.

Teamwork, simulation and the culture of safety

Historically, medical education has focused on autonomy of health care providers who are expected to take care for a patient on their own. Consequently, issued related to teamwork, multidisciplinary and multi-professionally interactions have not been explicitly and formally included in medical curricula. In addition, the hierarchical organization of medicine, mainly expressed by a communication philosophy following a chain of command, has strongly contributed to discourage teamwork-based patient care.

Health care providers are mainly trained as individuals, yet work almost exclusively as teams, showing a big difference between education and reality. Poor communication has been identified as the primary root cause in more than 70% of perinatal sentinel events recorded by the Joint Commission on Accreditation of Health Care Organizations [1] that suggested simulation training as an effective way to improving teamwork as one of the means to improve patients safety [2].

Stress, poor communication, failure to identify and correct errors, and the culture of blame, often lead to undesired outcomes in patients care. This is especially true in disaster medicine situations that are always influenced by high levels of stress of both rescuers and victims.

Simulation is now widespread in many fields of human endeavour and its history stretches back over centuries. The modern aviation industry has developed high-fidelity flight simulation and has led on improving the non-technical skills of teams through crew resource management programs. Crew Resource Management (CRM) and Human Factor (HF) are acronyms used by airlines designed for safety training and educational systems for high-risk industries. The basic concept and mission of these training programs are to reduce mistakes or errors resulting in safer and more efficient workplaces from fewer incidents and accidents.

Aviation addressed these issues several decades ago, realizing that HF account for 70% of all aviation incidents and accidents [3]. This led to the development of CRM or HF that trains multiple disciplines to work together in a coordinated and safety environment. Simulation programs introduce CRM to medical facilities and hospitals to assist in the identification and management of errors. CRM training emphasizes skills on how to

communicate and to recognize the value of debriefings. Evaluations indicate CRM training programs more effective to reduce medical errors and improve the work environment [3].

CRM , disaster medicine and non-technical skills

Anaesthesiology was one of the first medical specialties to demonstrate the impact of human factors. Indeed, in the early '90s, David Gaba and colleagues, at Stanford University, designed a mannequin-based simulator to systematically tackle such challenges during anaesthesia crisis situations [4]. This group lead by David Gaba developed the concept of anaesthesia crisis resource management (ACRM), which addressed human factors in the operating-room setting [4]. Since then, several centres around the world have implemented simulation-based crisis resource management training. As the concept extended into different domains and specialties, it was called crew resource management (CRM) [4].

Communication, teamwork, decision making and situation awareness, in addition to medical knowledge and practical skills have been well defined in medical literature as categories of competencies that are necessary for a team to operate effectively. The principles of CRM are intended to help prevent and manage difficulties during medical care, and they reflect both the team-oriented and cognitive aspects of human factors. Acquiring CRM abilities is often associated with a change of attitudes and behaviours as well as learning of new skills and de-learning of former habits. Change is necessary at the individual, team and organizational levels [4].

Medical teachers should be aware of two main types of skills: technical (psychomotor) and non-technical [5]; the latest includes significant skills that deserve specific mention like decision making, flexibility, assertiveness, mutual respect, identifying priorities, situational awareness, fixation errors management. All these skills can be effectively thought and practiced by simulation. Overwhelming compelling evidences highlight the importance of simulation-based training as a method to improve teamwork for patients safety.

Simulation and technical skills

The use and the efficacy of devices and skill stations to acquire psychomotor skills is well defined. The step-by-step specific-task-training approach has been shown to be useful to accelerate skill acquisition for a large wide number of psychomotor tasks such as airway's management, ultrasound-guided central venous access and regional anaesthesia techniques [13][14].

Procedural skill teaching theories have evolved substantially over the last two decades. We have moved from the old adage of "seeing one, doing one and teaching one" through the three-stage theory of motor skills acquisition 3 to the more recent four-stage approach [15][16][17].

The four-stage approach breaks down the skills teaching process into 4 stages (demonstration, deconstruction, formulation, performance). By following the steps, the trainee shifts from being 'consciously incompetent' (realising he can't do it) to being 'consciously competent' (being able to do it with great thought). Only with repeated practice 'on the job' he will be able to perform satisfactorily in a variety of situations, thus acquiring the state of 'unconsciously competent'. This strategy is currently applied in several clinical education settings, including resuscitation courses and simulation settings [18].

Reflective practice and debriefing

Sharing critical points raised during teaching sessions is essential for learning in medical education settings. This is particularly true in simulation based medical education (SBME) which potentially creates high levels of stress in both instructors and trainees.
Debriefing has been shown to be an essential part of simulation-based learning process. Savoldelli et al. demonstrated that simulation without debriefing is ineffective because errors can be repeated if team members have not been informed that they were making mistakes [25].

In the last 20 years, the judgmental approach to debriefing, mainly based on the "shame-and-blame" method, has been strongly criticized and discouraged because of its severe costs in terms of humiliation, frustration and depressed motivation [26][27].
The non-judgmental model to debriefing has been widely practiced using different strategies and approaches as the Socratic model (leading questions and "easing in") [28] or the sandwich model (good things followed by points of improvement in a rigid sequence) [29][30].

Albeit the non-judgmental approach has the significant advantage to not hurt trainees' feelings, it has some important weaknesses. First of all, it fails to openly disclose major problems felt by both the teacher and the student. In other words, always giving priority to positive aspects is often felt as artificious especially when a critical point engages trainee's attention. In poor trainee's performances, showing a relentless optimism may convey the embedded message that mistakes are not discussible, or possibly shameful.
"Reflective practice" is a term coined by Donald Schon [31] to describe a method to improve personal and interpersonal effectiveness of professionals by examining the values, assumptions, and knowledge-base that drives one's own actions.

Research in cognitive science [32][33] and on reflective practice, provides a conceptual model that guides the teachers on how to discover the mental models that were used in guiding trainees' actions during the teaching session. Trainee's actions have always a logical sense if framed in the cognitive model used to get a result. According to this, mistakes are always or mainly caused by meaning-making systems of the trainees such as their frames, assumptions, and knowledge.

Using reflective debriefing the focus widens to include not only the trainees' actions, but also their mental models that ultimately determined the final result. Mistakes are not a source of shame and blame any more but a precious learning resource to be openly disclaimed and discussed.
Transparent talk about trainees' mistakes is achievable by a three step approach:

1. observation/description, the teacher observes and describes trainee's action
2. comment/opinion, the teacher offers his/her idea about that
3. mental model disclaimer, the teacher shows his/her interest (curiosity) to discover the mental model that framed student's action.

Reflective debriefing increases the chances that the student will be able to accept teacher's feedback without being defensive and feeling psychologically safe. It provides trainees with a clear message about the instructor's point of view while reducing the background noise of misunderstandings and defensiveness that can be associated with the judgmental and non-judgmental approaches.

Psychological Support after Disasters

A. Nuray Karanci, Salli Saari and William Yule, Standing Committee on Disaster, Crisis and Trauma Psychology, European Federation of Psychologists Associations (EFPA)

Disasters and crises have widespread impacts on many people and structures throughout a society. Psychologists are recognized as having important roles in advising civil emergency personnel in planning (and taking decisions under extreme stress), as well as in immediate, short and long term interventions to mitigate any psychological effects on survivors, emergency responders and their families. Relatedly, the past few years have seen a rapid development in the field of disaster and crisis psychology, both in terms of interventions and in preventive work in relation to crisis situations [1][5][4][6][10].

Dealing with psychological victims

In disasters, the survivors are primary psychological victims; however the people left behind following a death - children, parents, other relatives, friends, colleagues, school friends and teachers of the casualties - are also victims. Other victims are eyewitnesses to the incident, rescue staff - firemen, emergency staff, policemen, ambulance drivers, doctors, nurses - and other health personnel. Those who have caused the accident or incident and people close to them may also be victims. Sudden, unexpected death or even a near death situation, or the physical devastation and extensive material loss resulting from disasters can have a strong psychological impact on all those people who were close to the disaster site, or who witnessed the event. Furthermore, due to extensive media coverage and social media increasingly more people are affected. In other words, the entire community experiencing the devastation can be counted as psychological victims of the disaster. Psychological distress following disasters is not only related to the event itself, but it is also related to the adversities in the post disaster environment.

The guiding principle of early intervention is that help must be provided immediately after the event, mainly during the first three days and then continue for a longer time as needed. Appropriate follow-up procedures are also necessary. An active search must identify the victims of the disaster or critical incident. Every psychological victim in any disaster has the right to receive psycho-social support and services [2][7][8][9][11][13].

Psychological methods used

There are some special psychological methods used in early interventions. Psychological first-aid, aiming to stabilize the condition of the survivors, provide them with security, social support, information and hope is a method that can be taught to non-professionals aiming to prevent further traumatization.

Psycho-education is another method used after disasters, by providing information on expected psychological reactions following exposure to a disaster and also giving information on appropriate coping strategies and stress management methods. Psycho-education can be given through written brochures or delivered by professionals. Another widely used method is psychological debriefing. Its purpose is to prevent after-effects such as post-traumatic stress disorders by systematically reviewing in detail what has happened and what are the impressions, thoughts and feelings of the victims. Debriefing also aims to reinforce group spirit and a feeling of solidarity, to activate social support and coping, and to normalize reactions. Recently the effectiveness of single, one-off debriefing has been questioned (e.g. [6][10]), and it needs to be applied by trained professionals.

Early trauma interventions also include the follow-up of the reactions and guidance to therapeutic services if needed. In trauma therapy, psychologists have recently developed new special methods and techniques, such as the Eye Movement Desensitization and Reprocessing (EMDR) and Trauma Focused Cognitive Behaviour Therapy (TF-CBT). The process of developing long-term intervention methods such as grief groups and trauma seminars has been promising. Today, psychosocial support and services include interventions in all phases of the crisis process, from early intervention to trauma therapy [12].

A rapidly expanding field

The European Federation of Psychology Associations (EFPA) has a Standing Committee on Disaster, Crisis and Trauma Psychology and has continued to develop its own micro-site as a part of the EFPA website with important information on disaster, crisis and trauma now available at http://disaster.efpa.eu/. The field is rapidly expanding and it is important to create awareness for the need for psychological support following disasters. It is also important to facilitate the training of psychologists, emergency workers and members of non-governmental organisations working in disasters in psychosocial support methods.

Ethics and resilience

Michel Prieur, Emeritus Professor at the University of Limoges (France)

The European and Mediterranean Major Hazards Agreement being an integral component of the Council of Europe, it was natural for it to concern itself with the ethical issues related to major risks, insofar as ethical questions are inevitably reflected in human rights, of which the Council of Europe is the guardian. This is why, at the invitation of Recommendation 1862 (2009) of the Parliamentary Assembly of the Council of Europe, addressed to the Executive Secretariat of the EUR-OPA Agreement, the Committee of Ministers of the Council of Europe noted, in its reply of 8 July 2009, that the Agreement would be drafting an Ethics Charter on resilience to major disasters.

A political support

The objective is to raise awareness among all the parties involved in a disaster, meaning not only victims, but also rescuers, authorities and humanitarian NGOs, of the fact that human rights are always affected by a disaster, whatever its origin and however serious it may be, necessitating shared common ethics which may help to improve the resilience of all concerned. Ethical reflexes, a form of practical translation of a moral code which is a tangible shared expression of classic human rights, may improve the reactivity of the persons concerned and help us to improve disaster prevention and to cope better with unpredictable and dramatic situations.

The 12th ministerial session of the EUR-OPA Major Hazards Agreement, held on 28 September 2010 in St Petersburg, recognised, in Resolution 2010-2, the value of applying the best ethical principles in disaster risk reduction, in improving resilience and in responding efficiently to emergencies. It was stated that "the vulnerability of communities and the environment is a major factor in exposure to disaster risks, which limits the potential for resilience, but these risks do not affect everybody in the same way and […] that poor people and socially disadvantaged groups suffer most from disasters". Furthermore, this resolution notes that: "increased resilience is dependent on reducing vulnerability as a whole, whether it is linked to poverty, gender, health, insecurity, family breakups, fear or panic, and that ethically responsible practices are required to achieve this".

An array of dispersed statements

It might have been thought that such considerations had already been expressed in several international agreements, but this is not the case. There are in fact no international treaties or political documents on the subject of human rights during disasters. There are just a few reports and operational guides listing those human rights which are at risk during disasters. Examples which may be cited are the 2004 project handbook and humanitarian charter of the NGO called Sphere, the 2006 "Operational guidelines on human rights and natural disasters" of the Inter-Agency Standing Committee (IASC), the handbook on "International Law and Standards Applicable in Natural Disaster Situations" written by Erica Harper for IDLO in Rome in 2009, and the University of Limoges draft convention on the international status of environmentally-displaced persons (CRIDEAU-CIDCE, 2008).

The relationship between ethics and disasters through human rights is nevertheless timidly referred to in the UN Commission's Human Rights Resolution 2005/60 on human rights and the environment as part of sustainable development (preamble and para. 8). Only two binding conventions link human rights and disasters, emphasising the special

attention to be given to the most vulnerable persons. These refer in the first case to children, namely the 1990 African Charter on the Rights and Welfare of the Child (Arts. 23 and 24), and in the second to persons with disabilities, in the Convention on the Rights of Persons with Disabilities (Art. 11), of 2006. Significant progress will come in the years ahead.

In addition to the Council of Europe's regional initiative through the EUR-OPA Agreement on ethics as a factor in disaster resilience, the UN's International Law Commission in Geneva has in fact included on its agenda since 2007 the codification in international law of "the protection of persons in the event of disasters". Thus a legal definition of a disaster has been produced for the first time: "'Disaster' means a calamitous event or series of events resulting in widespread loss of life, great human suffering and distress, or large-scale material or environmental damage, thereby seriously disrupting the functioning of society" (Art. 3 of the draft articles, ILC, 24 July 2009). It will be noted that the aim during these efforts to codify human rights in the event of disasters is to include both natural and technological disasters, insofar as the things that matter most are the provision of relief and the consequences for people's individual and collective rights, irrespective of disasters' actual or assumed causes. The only exclusion relates to armed conflicts, already covered by international humanitarian law.

An integrated approach

The originality and benefits of the Council of Europe document which takes account of the role of human rights as a factor in disaster resilience, setting out "ethical principles relating to disaster risk reduction" (Council of Europe, AP/CAT (2011) 02, of 7 April 2011), are that an integrated approach is taken to the disasters and human rights issue, not only considering what happens during the disaster, but also what happens before and after. This is a document which is not legally binding and merely reminds states and all stakeholders and disaster victims that there are already some ethical principles which are universally recognised in human rights law by international and regional treaties, and that these principles need to be taken into account even at times of crisis or in exceptional circumstances. On occasions of this kind, when society is disorganised, there is all-too-often a natural tendency to overlook, or even to violate, the fundamental principles of the protection of individual rights.

Each and every individual should, in the event of a disaster, behave in a manner compatible with the fundamental principles, such as non-discrimination, solidarity, respect for human dignity, and impartiality. Advance information and the right to participation in particular need to be safeguarded before a disaster even occurs, so that victims' resilience to the disaster is greater. Special preventive measures should be organised at workplaces, schools and hospitals, with particular attention being given to the most vulnerable groups (children, the elderly, persons with disabilities, members of minorities). Any preventive or forced evacuation must take place in conditions of transparency and dignity.

When a disaster occurs, rescuers' rights and duties are vital and must be based on clearly understood individual and collective ethics. Human dignity must be respected not only when emergency assistance is provided to the most vulnerable victims, but also during rescue efforts and at temporary accommodation. The media must treat disaster victims in a dignified and respectful manner. And after a disaster, civil and political rights as well as economic, social and cultural rights must speedily be guaranteed for each and every person, ensuring that families can get back together, orphans be cared for, and due respect be shown to the dead and to local cultural traditions.

Some major challenges for the future …

Francesc PLA, Deputy Executive Secretary

While the European and Mediterranean Major Hazards Agreement EUR-OPA is proud to celebrate its 25th anniversary in 2012, the fact that it deals with disasters with sometimes an expected return period of over 100 years makes us aware that 25 years is in fact quite a short term with respect to the phenomena we work on. The contributions presented here by eminent experts show that even if important progress in the knowledge on hazards and the ways to deal with the associated risks had been achieved during that period, much remains to be done, in particular due to the intrinsic dynamics of hazardous phenomena.

The truth is that, and in spite of the progress accomplished, many current challenges remain basically the same as in 1987. Actually, the world has also evolved in such a way that risk factors have increased through both greater frequencies of events and/or increased magnitude. In fact, several recent trends in our societies appear as crucial factors in such evolution, reinforcing the need to focus on natural and technological disasters in order to mitigate their potential consequences.

- Climate change

On the shorter term, climate change cannot be considered itself as a new source of risk but rather as an additional element fostering the emergence of already existing risks such as floods, droughts or extreme temperatures. In the longer term however, climate change can lead to the emergence of new hazards in regions where their potential risk was almost negligible: the landslides stemming from the meltdown of permafrost or the sea level rise appear as clear examples of such longer term impact.

The combination of these factors requires the adoption of both short term measures to cope with the increased vulnerability and long term measures to face the potential emergence of significant hazards, measures which have to be coordinated. Furthermore, an additional challenge on actual prevention measures is precisely related to the uncertainty on the future evolution of the underlying phenomena as all the work on climate change is based on scenarios: it requires from disaster management the inclusion of increased flexibility in the measures taken to be able to cope with real future situations.

- Urbanisation

Another key element for future risk management is the continuous trend to concentrate population and assets in urban areas. Predictions show that Europeans living in urban areas will pass from 72% in 2008 to around 80% by 2020 and in several countries the proportion will be 90% or more. That implies an increased centralisation of means to face disasters and also an increased vulnerability associated to urban areas where the high density of population turns out to be an added problem.

Furthermore, that trend also implies a potential increased vulnerability in non-urban areas as their abandonment of traditional use may lead to increased vulnerability, as inappropriate forest or water management illustrate. A sounder spatial planning with respect to potential risks is thus a crucial issue for these new urban areas and the rehabilitation of existing ones is maybe even more challenging for concerned municipalities.

- Human perception

Even if modern media can more easily reach the population and consequently inform people more accurately and promptly through its many channels (radio, television, internet, etc.), the perception of risk by people seems to remain quite low in our societies. Too often risks are minimized by individuals or societies either for subjective reasons (negative content associated to risks) or for objective reasons (protection of ways of life or assets).

These phenomena are often fostered by an incorrect perception of the probability of an event: a low probability does not mean it could not happen right now or in the near future ... Consequently, risk awareness is still a crucial issue for the future as all decisions build on human decision to a large extent based on their perception (or not) of the problem. Focusing too much on the post-disaster aspects instead of on the necessary prevention measures may only reinforce the natural tendency to underestimate the threats, often leading to fatality, thus ignoring our own share of individual responsibility.

- Financial constraints

Last but not least, the various actions in terms of prevention and/or intervention require an important amount of resources for their implementation. In a context of poor public finances made worse by the recent crisis, traditional heavy investments to prevent disasters turn out to be, apart from technically complex, more and more difficult to fund. Unfortunately, political priorities may focus for a while on short term, low scale measures

instead of launching long term, structural ones more likely to significantly improve the resilience of our societies.

This shortage of public resources forces all to consider innovative approaches to increase the protection of our societies, in spite of that added significant constraint. One possible approach is to promote more private initiatives in the domain, using as clear incentive the potential losses of inaction. Another complementary approach is to search for less capital-intensive solutions, such as the environment-based measures evoked earlier. In any case, adopting new open-minded approaches involving stakeholders from various horizons will no longer be wishful thinking but a real need.

To conclude this tentative look at the future, it must be emphasized that the new challenges mentioned are not intended to steer fear but rather to focus on the domains which will influence the future action of the Agreement. Only an accurate perception of the actual and future difficulties societies need to overcome can lead to accurate responses and these responses have to be developed more than ever within a coherent local/regional/national/international framework. That search for efficient international multidisciplinary solutions will remain at the end of the day the main goal to achieve by our European and Mediterranean Major Hazards Agreement in its (at least!) forthcoming 25 years.

Appendices

Resolution (87)2 setting up a Co-Operation Group for the Prevention of, Protection against, and Organisation of Relief in Major Natural and Technological Disasters

(adopted by the Committee of Ministers on 20 March 1987 at the 405th meeting of the Ministers' Deputies)

The Representatives on the Committee of Ministers of France, Greece, Italy, Luxembourg, Malta, Portugal, Spain and Turkey,

Considering Resolution (72) 6 on precautions against natural and other disasters and the planning and provision of disaster relief, adopted by the Committee of Ministers of the Council of Europe on 18 February 1972;

Having regard to, the Declaration of the ministers responsible for the prevention of, and protection against, major natural and technological disasters in southern Europe *(Note of the Secretariat: Cyprus, France, Greece, Italy, Malta, Portugal, Republic of San Marino, Spain, Turkey)*, adopted in Ravello on 10 June 1985;

Having regard to the principles for the use of resources in the event of disasters adopted on 11 December 1985 at the 2nd informal meeting of the ministers responsible for the prevention of, and protection against, major natural and technological disasters in southern Europe;

Considering the interest and the different activities of the Commission of the European Communities regarding the problems of civil defence (protection civile);

Having regard to the training programmes undertaken in the field of prevention of, and protection against, major disasters at the European University Centre for the Cultural Heritage of Ravello and at the European Centre for Disaster-related Medicine of San Marino;

Having regard to the conclusions adopted at the 4th informal meeting of the ministers responsible for the prevention of, and protection against, major natural and technological disasters in southern Europe in Istanbul on 8 and 9 December 1986, proposing the establishment of an Open Partial Agreement;

Having regard to the Committee of Ministers' Resolution (51) 62 concerning Partial Agreements;

Recognising the need to enable the informal meeting of ministers responsible for the prevention of, and protection against, major natural and technological disasters in southern Europe to carry on its activities as efficiently as possible,

Resolve to set up a Co-operation Group for the prevention of, protection against, and organisation of relief in major natural and technological disasters.

I. The aim of the group shall be to make a multidisciplinary study of the co-operation methods for the prevention of, protection against, and organisation of relief in major natural and technological disasters.

II. The working methods employed hitherto by the group shall be maintained under this Partial Agreement.

i. Meetings. In private, at ministerial level, as a general rule every two years, but circumstances and urgency may justify special meetings of the group in addition to these two-yearly meetings;

ii. Each state is represented at the meetings either by the minister(s) concerned with the subject being dealt with, or by the minister instructed by his Government to co-ordinate the action of ministries concerned with major natural and technological disasters. A permanent correspondent appointed for

each state is responsible for preparing the group's ministerial meetings in personal liaison with the minister(s) attending them; he may be assisted by experts;

iii. The permanent correspondents and their experts meet twice during the interval between ministerial meetings to follow the application of the guidelines adopted and to prepare the ministers' future meetings in accordance with a given mandate. Their duties, in this connection, include:

- arranging the agenda and subjects of the coming ministerial meeting,
- collecting material for the preparation of basic documents,
- making arrangements for the practical preparation of ministerial meetings,
- exchanging information on the latest developments in the participating countries concerning the subjects dealt with by the ministers at previous meetings;

iv. The group decides on the publication of documents drawn up by the permanent correspondents as well as resolutions adopted by it;

v. The languages used at meetings are English and/or French;

vi. The meeting papers are reproduced in English and/or French. Activities. Co-operation programmes on:

- relief organisation: doctrines, information, simulation, assistance, etc.,
- training and research implemented in co-operation with specialised centres forming networks. (Note 1)

III. Any member state of the Council of Europe may join this group at any time by notification addressed to the Secretary General of the Council of Europe.

IV. States not members of the Council of Europe and the European Communities may join the group with the unanimous agreement of the member states of the group.

V. The Secretariat General of the Council of Europe will provide the group, with the help of the European University Centre for the Cultural Heritage of Ravello and other specialised centres and, particularly as regards the ministerial meetings mentioned under 3 below, with the help of the centre responsible for the practical organisation, with the following secretariat services:

1. Preparation and distribution of papers for the group's meetings at both ministerial and permanent correspondent level;
2. Convening of meetings;
3. Practical organisation of the group's ministerial meetings;
4. Practical organisation of the group's meetings at permanent correspondent level at the rate of two in each interval between ministerial meetings;
5. Translation of the group's papers into English or French;
6. Provision of the staff required by the group for its functioning;
7. Preparation and circulation of the conclusions of the group's meetings.

VI. The group's operational expenditure under the Partial Agreement shall be apportioned as follows:

1. The travel and subsistence expenses of persons attending the group's meetings (ministers, permanent correspondents and experts) shall be paid by the member state concerned;
2. Additional expenditure arising from die organisation of meetings elsewhere than at the scat of the Council of Europe shall be borne by the host country;
3. Expenditure relating to the implementation of co-operation programmes and common secretariat expenditure (papers, staff, missions, translation, interpretation and all other operational expenditure) shall be covered by a Partial Agreement budget funded by the group's member states and governed by the same financial rules as foreseen for the other budgets of the Council of Europe.

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(Note 1) At the time of adoption of this resolution, the centres are the following:
- European Centre for Disaster-related Medicine of San Marino;
- European University Centre for the Cultural Heritage of Ravello;

- European Training Centre for Natural Disasters (Turkey);
- European Centre on Prevention and Forecasting of Earthquakes, Athens,
- European Centre of Geodynamics and Seismology of Walferdange (Luxembourg);
- European Mediterranean Seismological Centre, Strasbourg (France);
- European Centre for Training and Research in the Field of Natural and Technological Pollution in the Mediterranean (Malta).

Date of accession of member states

	**Albania**	**1993**		**Luxembourg**	**1987**
	**Algeria**	**1991**		**Malta**	**1987**
	**Armenia**	**1993**		**Moldova**	**1998**
	**Azerbaijan**	**1993**		**Monaco**	**1990**
	**Belgium**	**1991**		**Morocco**	**1995**
	**Bosnia and Herzegovina**	**2012**		**Portugal**	**1987**
	**Bulgaria**	**1994**		**Romania**	**2001**
	**Cyprus**	**2000**		**Russian Federation**	**1990**
	**Croatia**	**2002**		**San Marino**	**1987**
	**France**	**1987**		**Serbia**	**2009**
	**Georgia**	**1993**		**Spain**	**1987**
	**Greece**	**1987**		**Turkey**	**1987**
	**"the former Yugoslav Republic of Macedonia"**	**1995**		**Ukraine**	**1997**
	**Lebanon**	**1997**			

Additional information on the associated Centres

From the 7 centres which constituted the "nucleus" of the Network in 1987, the network has grown 25 years later to 27 centres spread over the 27 member countries.

List of specialised centres

Scientific and Technical Research Centre on Arid Regions	CRSTRA	*Biskra, Algeria*	
European Interregional Scientific and Educational Centre on major risks management	ECRM	*Yerevan, Armenia*	
European Centre on Training and information of Local and Regional Authorities and Population in the Field of Natural and Technological Disasters	ECMHT	*Baku, Azerbaijan*	
Higher Institute of Emergency Planning	ISPU	*Brussels, Belgium*	
European Centre for Risk Prevention	CSLT	*Sofia, Bulgaria*	
Bulgarian National Training Centre	BNTC	*Sofia, Bulgaria*	
European Centre for Disaster Awareness with the use of Internet	BeSafeNet	*Nicosie, Cyprus*	
European Centre for Seismic and Geomorphological Hazards	CERG	*Strasbourg, France*	
European Mediterranean Seismological Centre	CSEM	*Bruyères-le-Châtel, France*	
Specialised European Centre on Coastal Risks	CERCO	*Biarritz, France*	
European Centre for the vulnerability of Industrial and Lifelines Systems	ECILS	*Skopje, "the former Yugoslav Republic of Macedonia"*	
European Centre on Geodynamical Hazards of High Dams	GHHD	*Tbilisi, Georgia*	
Global Fire Monitoring Centre	GFMC	*Fribourg, Germany*	
European Centre on Prevention and Forecasting of Earthquakes	ECPFE	*Athens, Greece*	
European Centre on Forest Fires	ECFF	*Athens, Greece*	
European University for the Cultural Heritage	CUEBC	*Ravello, Italy*	

European Centre for Geodynamics and Seismology	CEGS	*Walferdange, Luxembourg*	
Euro-Mediterranean Centre on Insular Coastal Dynamics	IcoD	*La Valette, Malta*	
European Centre for Mitigation of Natural Risks	ECMNR	*Chisinau, Moldova*	
Euro-Mediterranean Centre for Evaluation and Prevention of Seismic Risk	CEPRIS	*Rabat, Morocco*	
European Centre on Urban Risk	CERU	*Lisbon, Portugal*	
European Centre for Buildings Rehabilitation	ECBR	*Bucarest, Roumania*	
European Centre of New Technologies for Risk Management	ECNTRM	*Moscow, Russian Federation*	
European Centre for Disaster Medicine	CEMEC	*San Marino, San Marino*	
European Centre on Social Research in Emergency Situations	CEISE	*Madrid, Spain*	
European Natural Disasters Training Centre	AFEM	*Ankara, Turkey*	
European Centre of Technological Safety	TESEC	*Kiev, Ukraine*	

Short description of each specialised centres

Centre for Scientific and Technical Research on Arid Regions Omar El Bernaoui – CRSTRA

Biskra, Algeria

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CREATION
1991

OBJECTIVES
- Carry out scientific and technical research programs on arid regions and/or regions threatened with drought or desertification
- Undertake and/or participate in an multidisciplinary research on Arid Zones;
- Constitute a scientific and technical databank on arid regions and to process, to store and to disseminate these data;
- Participate in any research aimed at understanding and fighting against human vulnerability to environmental changes.

MAIN ACTIVITIES
Research
Five strategic directions axes:
- Hydrous resources exploitation optimization
- Saharan Agriculture
- Steppe and desertification
- Climate / Environment
- Socioeconomic aspects

The scientific organization of the Centre fits with the research programs :
- Biological Resources in Arid Zones Division: contribute to conservation and rational management of bio resources.
- Water and Soil Resources Management in Arid zones Division: develop Tools for Quantifying and managing quantitative and qualitative resources.
- Desertification Monitoring Division: keep ecological control in oasis and steppe areas by developing an early warning system.
- Economic, Social and Cultural Development of Arid Zones Division: study of Socio-economic and cultural mode of development.

Training
Addressed to researchers and support staff to research, the more recent are:
- Intensive course: Tools and concepts in development research methodology (2007)
- Training workshop on the floristic and faunal bearings of wetlands in arid regions (2008)
- GIS - Remote Sensing Technique (2007/2008)
- Intensive courses in statistics and data processing (2008-2010)
- Courses on Vegetation Mapping (Case of steppes and the Saharan regions) (2010)

European Interregional Scientific and Educational Centre on major risks management - ECRM

Yerevan, Armenia

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CREATION
1995

OBJECTIVES
The Centre carries out multidisciplinary activities. Programs are implemented in compliance with the priorities set by of the Council of Europe 's European and Mediterranean Major Hazards Agreement in the field of disaster risk reduction in close collaboration with other Agreement 's European Network Centres, other international institutions, as well as the Armenian Rescue Service and Crisis Management Academy under the Ministry of Emergency Situation and other concerned organizations of the Republic of Armenia.
The priority is given to the active methods of work contributing to prevention, adequate response and relief in the emergency management related activities:
. Preparation and implementation of the programs and educational materials targeted at awareness raising and improved preparedness to disasters by the population, local governments, including the most vulnerable people (in particular, children and people with disabilities), as well engagement of civil society in disaster risk reduction activities
· Activities, directed at enhancing and harmonizing the legislation in the area of civil protection, disaster risk reduction and emergency response,
· Initiatives for development and implementation of the regional programs aimed at trans-frontier disaster risk reduction.

MAIN ACTIVITIES
Development and implementation of the Project "National and Municipal Campaigns on informing and warning the population about emergencies at central and municipal levels (basis for establishing a regional early warning system for the Southern Caucasian countries and neighbouring states in trans –frontier emergencies)" (2005-2013).
Preparation of additional educational materials aimed at awareness raising and improved preparedness to disasters and their pilot adoption in schools and other educational establishments (2006-2013)
Participation in elaboration of proposals, aimed at launching, improving and subsequent functioning of the National Platform of Armenia on disaster risk reduction and further engagement in it of a civil society, as well as its integration into the European Network of National Platforms (2010-2013)
Organization of training in first aid skills within the Armenia-French joint Program framework (1997-2013)
Engagement in the Project "Enhancing cooperation between national, regional and local authorities in the field of disaster risk reduction under supervision of the Higher Institute for Emergency Planning (ISPU, Florival, Belgium) (2012-2013)
Engagement in the Project: "Nuclear Hazard: Chernobyl and Fukushima: lessons for public awareness", coordinated by the European Centre of Technological Safety (TESEC, Kiev, Ukraine (2012-2013)
Engagement in the project: "Seismic protection of Monuments (Preparation of regulatory documents for design of structural intervention in monuments in earthquake prone areas)", coordinated be the European Centre (ECPFE) Athens, Greece (2012-2013)
National Program for implementation of the Partnership and Cooperation Agreement, concluded between the Republic of Armenia, European Community and its Member- states: "Rapprochement of the Legislations of the European Union, Member-States of the EU and the Republic of Armenia"

European Centre on Training and Information of Local and Regional Authorities and Population in the Field of Natural and Technological Disasters – ECMHT

Baku, Azerbaijan

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CREATION
1995

OBJECTIVES
Spread in the country the international experience in the fields of population notification in cases of major hazards, protection organization and elimination of consequences.

MAIN ACTIVITIES
Importance and real possible ways of preparation of masters' degree in the republic – high skilled national cadres for risk management at university level (together with the Education Ministry of Azerbaijan Republic and Azerbaijan State Construction University)
General program maintenance of the forecast of impact to the health of harmful substances (hazards materials) released to the atmosphere as a result of industrial accidents (jointly with the Kiev Centre TESEC)
Use of the "SESAM" program (French experience) in the schools of Azerbaijan.
Conferences
Scientific-practical conference 2007 : "The principles of organization of risk culture training in secondary schools within the framework of education reforms being conducted in Azerbaijan Republic" (*with the Education Ministry).*
Scientific-practical conference 2009 : "Rules on organization of civil defence and struggle against emergency situations in private ownership conditions, in the rural areas and duties of entrepreneurs, municipalities, local executive authorities" (with *the Justice Ministry and the Association of Municipalities of Azerbaijan)*

Higher Institute of Emergency Planning – ISPU

Brussels, Belgium

CONTACT
Address: Centre Gouvernemental de Coordination et de Crise, Rue Ducale, 53 / 1000 Bruxelles
Tel. : +32 2 506 48 81
E-mail: ispu.hin@ibz.fgov.be **Web :** http://www.ispu.eu/

CREATION
1991

OBJECTIVES
The ISPU seeks to make the approach to emergency planning and management more professional by building up relevant expertise and making it available to those involved in crisis management. Exchanges of information and know-how with foreign countries also form part of the approach. These activities go hand in hand with the essential analysis of hazards and vulnerabilities – carried out by the Government Co-ordination and Crisis Centre (www.crisis.ibz.be), of which the ISPU forms part, including work at cross-border level.

MAIN ACTIVITIES
The IPSU's activities involve four strands:
- Research and development
- Information sharing and training
- Development of legal and practical tools, eg emergency planning guides
- Establishment of a network of experts

• **Research**
The ISPU runs every year a research project related to emergency planning. To this end, it calls on teams of university researchers to address vital issues concerning emergency planning and management.

• **Guides**
- Emergency planning guide for transport and transit pipelines for gaseous and liquid substances in Belgium (2008)
This guide addresses the issue of pipelines with a view to drawing up an emergency plan and intervention plans, and is supplemented by hazard maps. Identification of the relevant hazards applies at local, provincial and federal level.
- Emergency planning guide for identifying and analysing hazards at local level (2009)
This guide sets out a method for identifying and analysing hazards. It is intended for local authorities, i.e. municipal and provincial authorities.
- Local emergency planning guide (2010)
This guide presents the latest emergency planning know-how and is intended both for local authorities and their response units and for their emergency planning officials.

• **Best practices**
As a specialised centre, the ISPU is conducting a multiyear comparative survey of legislation on major hazard management in the member countries of the Council of Europe's EUR-OPA Major Hazards Agreement. The results of this project and the best practices identified here are published on the website www.ispu.eu. The member countries are also invited to publish factsheets describing the various tools available to them or which they have developed.

• **Seminars and conferences**
The ISPU identifies the training on offer with a view to making it available to those involved in crisis management and supplements it by holding information/training seminars. It also builds up its own know-how by taking part as a contributor or ordinary participant in colloquies and training events held in Belgium and elsewhere. This involves establishing useful synergies with Belgian and foreign universities and research centres in the area of training in hazards and emergency planning and management.

European Centre for Risk Prevention – ECRP

Sofia, Bulgaria

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CREATION
1977

OBJECTIVES
- Organise activities related to risk prevention: risk sciences, legal aspects, playing and policies.
- Support and coordinate activities related with risk prevention - Cultural heritage and harmonization with good European practices.
- Improve the level of information and adequate reaction of the population in crisis situation, specially through the education or training systems at school level.
- Increase the awareness of decision-makers in order to establish a safer world at national, European and international levels.
- Develop European cooperation in the field of scientific research, evaluation and dissemination of experience in risk prevention training and crisis management at school level.

MAIN ACTIVITIES
Prevention
- Improve prevention and preparedness and promote good governance.
- Evaluate and establish a risk mapping and use information in spatial planning.
- Improve environmental resilience and asses increased risk from climate change.
- Improve governance of disaster risk reduction.
- Promote a national platform within the European Forum for Disaster Risk Reduction.
- Identify problems and vulnerabilities.
- Promote appropriate policies and improve governance of prevention and response.

Education
- Promote research and use of knowledge in disaster risk reduction.
- Promote a better culture of risk and provide better information on environmental security and risks situations. The combined education and family life and school levels is the basic knowledge which civilians use to respond to emergency situations.
- Provide to pupils, according to their age group, a minimum knowledge and basic practical skills for protection to respond in due time in case of disaster and carry out preventive activities.
- Contribute to the training of other population at least by conveying basic knowledge and practical skills, which remain in the mind of a greater part of the population.

Culture of risk
Development of the Be Safe Net project (with Nicosia, Sofia, Ravello, Strasburg, Malta, Kiev centres): a risk prevention training website at school level in several languages, 2002-2011.

University training
Collaboration with the New Bulgarian University (Sofia) on bachelor program "Civil and Corporative security" with elements of Crisis Management; Master Programs: Information security, National and international security, Antiterrorist training; Doctoral programs.

Research
Participation to several International Projects: "Risk Sciences: Employment and Training",1996; "Mobilization of the Scientific Community to improve risk management", 2001; "Comparative study of the regulations concerning Major Risk Management", 2003; "Prevention and Crisis management of floods and chemical accidents", 2004; DAPHNE 2 program "Violence at schools", 2004/05; DRACE – "Danube a river for all, care for everybody" portal (http://www.drace-project.org), 2006-2011.

Other
"Regional security centre" enabling 24-hour satellite monitoring of the situation and risk level for the emergence of forest fires, floods and other hazards, 2010-2011.

European Centre for Disaster Awareness with the use of the Internet - BE SAFE NET

Nicosia, Cyprus

CONTACT
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CREATION
2003

OBJECTIVES
Development of an organized Network among countries, in a first step at school level, with the use of the Internet, aiming at the provision of information and knowledge to groups of people, for prevention, preparedness, immediate reaction and rehabilitation for risks and disasters.

MAIN ACTIVITIES
The Centre carries out activities relating to the preparation of the specification of the Website "BeSafeNet" and the administrative arrangements for the various functions of the Centre.
The specifications of the Site, respond to a state to art portal Internet Site. The future activities of the Centre will be focus to supplement the Network with all the official languages of the Council of Europe, Italian, Bulgarian and Greek language, the enrichment of the Site and the promotion of the project especially to young people and schools.

European Mediterranean Seismological Center - EMSC

Bruyère-le Châtel, France

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E-mail: bossu@emsc-csem.org **Web:** http://www.emsc-csem.org

CREATION
1975

OBJECTIVES
Scientific Activities

MAIN ACTIVITIES
- Management of an alert system for possible destructive earthquakes
- Management of a rapid information system on seismicity
- Production of the Euro-Mediterranean Seismologic Bulletin
- Promotion of research and collaboration between Euro-Mediterranean countries (and particularly with UNESCO)
- Participation in European Projects
- Participation in international congresses (ESC, AGU, RELEMR, IASPEI,…)
- Development of innovating methods of detection, based on the citizens' implication
- Development of the concept of "civil seismology": to encourage witnesses of earthquakes to share their experience (using our on-line questionnaires and our tools for sending photos) in order to contribute to better evaluation of their effects.

European Centre for Costal Risks – CerCo

Biarritz, France

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Web:
http://www.centredelamer.fr/index.php?option=com_content&task=view&id=84&Itemid=114

CREATION
2008

OBJECTIFS
A non-profit-making organisation, its objectives are to provide education and training and to carry out research into coastal hazards and the ensuing risks to the coastline.

MAIN ACTIVITIES
Research
The "Vulner'hab" project
Research programme, run in co-operation with the AZTI-Tecnalia foundation (Spanish Basque country), assessing loss of habitats when sea levels rise at a "pilot" site, Txingudi Bay.
Training
Specialised training courses: "Knowledge and management of coastal risks"
Courses designed for local and regional authority staff and postgraduate students
- Physical risks: erosion, storm surges, flooding, cliff collapse
- Chemical and biological risks: pollution of marine and terrestrial origin (drainage basins)
- Information about management and decision-making tools

This training is attended by coastline stakeholders and researchers and is intended to promote exchanges between users and producers of decision-making methods and tools.
Participation in the "Coastal hazard assessment and risk management" course run by the CERG European Centre (19-25 June 2011)
Other activities
Organisation of an international symposium on coastal risks: "Vulnerability of coastal ecosystems to global change and extreme events"
The research described at this symposium will be considered from three angles, giving an interdisciplinary approach:
- Physical
- Biological
- Chemical

The symposium will be accompanied by a professional exhibition of innovative coastal risk assessment and prevention techniques.

European Centre on Geomorphological Hazards – CERG

Strasbourg, France

CONTACT
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CREATION
1988

OBJECTIVES
Development of multidisciplinary research in the field of geo-morphological and geo-hydrological hazards and dissemination of methodology and techniques through advanced training courses and guidebooks.
Promotion of scientific and technical co-operation between CERG European members and exterior individuals or organisations.

MAIN ACTIVITIES
Training
- European Intensive Summer Courses (France –Martinique, -South Alps, Normandy, Italy, Austria, Portugal, Spain, etc.)
- Post-Graduate Training Schools:
  - Coastal hazard assessment and risk management (Caen, France, 2011)
  - - Quantitative risk assessment and management (Barcelona, Spain, 2008)
  - - Multi-RISK – Concepts to approach multi-hazards (Bonn, Germany, 2008)
  - -Living with hydro-geomorphological risks, from theory to practice (Strasbourg, France, 2004)
- Implementation of the Be-Safe-Net website "Disaster Awareness with the use of the Internet".

Research
- Seism and landslides: research on landslides triggered by earthquakes to improve their spatial prevision and their prevention (research developed in North and Central Apennines, Portugal, etc.);
- Geomorphological mapping of the upper Tagliole valley (Modena Apennines, Northern Italy) ;
- Inventory of landslide risk assessment methodologies used in the EU-25;
- State of the art in multiple hazard and risk studies;
- Identification of thresholds for landslide crises, and implications for operative early warning systems.
- Landslide susceptibility mapping at the European scale
- Coastline at risk: methods for multi-hazard assessment
- Real-Time Management of Emergency Phase in the aftermath of Natural Disasters
- An update on multi-hazard risk assessments
- Applicability of Fibre Optic cables for landslide early warning systems.

Other
- Research programmes prepared and financed through CERG's initiative: Epoch, Teslec, Newtech, Alarm, Ramsoil, Mountain-Risks, Changes, ChangingRisks, etc.;
- Technical expertise in occasion of natural disasters in Europe: landslide in the Leusheni area (Moldova, 1997), debris flow threat to the city of Kvareli (Georgia, 2000), etc.;
- Involvement of CERG members in the Scientific Committee of national research programmes.

European Centre on geodynamical Hazards of High Dams - GHHD

Tbilisi, Georgia

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CREATION
1996

OBJECTIVES
Development of multinational, multidisciplinary approach to the problems of geodynamical hazards, generated by high dams, including:
• development and testing of modern methods of multidisciplinary monitoring/diagnostics of local and regional geodynamical processes in the proximity of large dams on the basis of Enguri Dam;
• creation of early warning systems;
• mathematical modelling of geodynamical processes at large dams, prediction of impending geodynamical events (earthquakes, tectonic deformations, landslides) and prognosis of response of large dams to these impacts;
• monitoring of processes and associated variations in physical properties of foundation rocks and dam material;
• creation of databases of geodynamical observations on large dams;
• analysis and generalization of possible geodynamical hazards, creation of scenarios of damages and instructions for public education on what to do in case of alarm, during and after the disaster;
• active participation in international, regional and national projects related to major disasters and environmental problems.

MAIN ACTIVITIES
Information, training, consultations
- preparation of papers, CD-ROMs, monographs on methodical aspects of large dams monitoring;
- information for media on natural hazards;
- organization of the courses on safety of high dams;
- participation in European and National Expert Councils: European Advisory Committee on Earthquake Prediction; National Council at Department of Emergency Situations, Ministry of Internal Affairs, Georgian National Committee on Disaster Risk Reduction.

Research
Development of monitoring and early warning systems on the Enguri Dam International Test Area:
- geodynamical: installation of modern tiltmeters NSH-1 (Russia); Applied Geomechanics (mod.701), USA; clinometrers, plumblines, strainmeters (Switzerland),
- seismic: installation and running of accelerometric network (GeoSys, Switzerland).
Compilation of Data Bases of geophysical, geodynamical, etc. collected over 30 years.
Dam's natural frequency Measurement and mechanical properties of material and foundation rocks.
Creation of probabilistic GIS-based seismic hazard maps of Caucasus, Georgia and communities.
Creation of theory of scaling- and strain- sensitivity of elastic properties.
Nonlinear analysis of monitoring data; flooding scenario due to dam damage (numerical model).
Participation in other projects on disaster risk reduction (INTAS, INCO-COPERNICUS, NATO Science for Peace, ISTC, FP7) dealing with seismic risk reduction and environmental problems.

Services offered by the Centre
- Slow motions' monitoring by tilt- and strainmeters, piezometers; testing, installation and service.
- Seismic Hazard Assessment (Intensity, Peak Ground Acceleration, Spectra) using GIS; field registration of micro- and macroseismicity, paleoseismic investigations of construction areas.
- Engineering Geophysics: seismic and electrical surveys of foundation of dams.
- Measurement of Physical Properties of Foundation Rocks and dam material.
- Dam control/early warning system design and exploitation: geodetic, topographic, temperature surveys, clinometers, plumblines, precise vertical drilling.
- Dam inspection, monitoring, maintenance; Dam safety analysis, static and dynamic FEM analysis.

The Global Fire Monitoring Center – GFMC

Freiburg, Germany

CONTACT
Address: Fire Ecology Research Group c/o Freiburg University Georges-Köhler-Allee 75 DE -79110 Freiburg,
Tél.: +49-761-808011 **Fax:** +49-761-808012
E-mail: info@gfmc.org **Web:** http://www.fire.uni-freiburg.de/

CREATION
1998

OBJECTIVES
As a global facility for vegetation fire monitoring, documentation and analysis, GFMC is:

- providing scientific and technical advice to governments, regional entities and international organizations, notably the UN, for the development of policies and strategies to reduce the negative impacts of fire on the environment and humanity
- serving as Secretariat of the UNISDR Wildland Fire Advisory Group the Global Wildland Fire Network and the International Fire Aviation Working Group; and leader of the UNECE/FAO Team of Specialists on Forest Fire
- offering liaison capabilities for providing assistance for rapid assessment and decision support in response to wildland fire emergencies under cooperative agreements with the Joint Environment Unit of the UN Environment Programme (UNEP) and the UN Office for the Coordination of Humanitarian Affairs (OCHA)

Within the Network of Specialised Euro-Mediterranean Centres the GFMC is focussing on cooperation European Centre on Forest Fires (ECFF) (Athens, Greece)

MAIN ACTIVITIES
Fire management at local, national, regional and international levels
- Local level – Community-based Fire Management (e.g., http://www.fire.uni-freiburg.de/Manag/CBFiM.htm)
- National to regional levels (e.g., Subsahara Africa: http://www.fire.uni-freiburg.de/GlobalNetworks/Africa/WFTCA.htm)
- Academic level (e.g.,http://www.fire.uni-freiburg.de/course/uni/BSc-fire-ecology.htm or http://www.fire.uni-freiburg.de/course/uni/postgraduate-course-wageningen.htm)
- Standards, competence (e.g., www.euro-fire.eu)

Fire ecology and fire management
- Fire ecology general (e.g., http://www.fire.uni-freiburg.de/feueroekologie/index.html)
- Prescribed Burning in Nature Conservation and Landscape Management (http://www.fire.uni-freiburg.de/programmes/natcon/natcon.htm)
- Fire Paradox (www.fireparadox.org)
- EuroFire (http://www.euro-fire.eu)

Outreach work to transfer science-based to the policy and management levels
- UNISDR Wildland Fire Advisory Group (http://www.unisdr.org/eng/task%20force/tf-working-groups4-eng.htm)
- UNISDR Global Wildland Fire Network (http://www.fire.uni-freiburg.de/GlobalNetworks/globalNet.html)
- FAO/UNECE Team of Specialists on Forest Fire (http://www.fire.uni-freiburg.de/intro/team.html)
- UNECE/FAO International Forest Fire News since 1988 (http://www.fire.uni-freiburg.de/iffn/iffn.htm)

European Centre on Prevention and Forecasting of Earthquakes – ECPFE

Athens, Greece

CONTACT
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E-mail: ecpfe@oasp.gr **Web:** http://ecpfe.oasp.gr

CREATION
1987

OBJECTIVES
The main objective of E.C.P.F.E. is the promotion of earthquake mitigation. For the implementation of the objective, the Centre fosters Trans-European activities with other EC with similar topics of interest such as: an earthquake mitigation and emergency management, training and public information, seismic protection of monuments, reduction of the vulnerability, etc.

MAIN ACTIVITIES
1. Protection of cultural heritage
A two-day international meeting was organized in Athens by EPPO and ECPFE in 2006 and in 2009, concerning the Seismic protection of Monuments.
Two Seminars on the same topic were also organized by EPPO and ECPFE in Athens and in Thessaloniki in 2010 and in 2011 respectively.
2. Reduction of the vulnerability
Learning about Earthquakes and Protection measures;
Guidelines for people with disabilities, also available in e-learning form in our website;
Risk elements removal temporal support and propping.
3. Education via e-learning techniques
A Workshop was organized in December 2009 with topic: "Code of ethics between Scientists and journalists in event of an Earthquake".
4. Prevention and Forecasting of Earthquakes
Search and rescue operations in Earthquakes
Emergency evacuation of the population in case of an earthquake
Prevention and mitigation of the psychosocial consequences of earthquakes

European Centre for Forest Fires – ECFF

Athens, Greece

CONTACT
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Web: http://www.gscp.gr/ggpp/site/home/ws.csp

CREATION
2003

OBJECTIVES
The Centre focuses on chemical and civil protection issues; forest fire smoke health impacts on the fire fighters and the exposed population, risk analysis and safety issues, personal protective equipment (PPE) and field chemical analysis with mobile instruments as a tool for early detection and identification of a hazardous environment. In addition, the Centre processes research projects and case studies for transferring knowledge and know-how from research groups to relevant organizations.
Other objectives include evaluation of new technologies, means and methods used for applications in forest fire early detection systems and fire frightening suppression tactics.

MAIN ACTIVITIES
Studies
Short and long term effects of forest fires smoke on fire-fighters and population, chemical and toxicological issues.
Methods and technologies for monitoring air quality during forest fires.
Scientific Work
Statheropoulos M. and Goldammer J.G., Vegetation Fire Smoke: Nature, Impacts and Policies to reduce negative consequences on humans and the environment European and Mediterranean Major Hazards Agreement (EUR-OPA), 4th International Wildland Fire Conference, Sevilla, Spain, 13-17 May 2007.
Dissemination activities - Workshops
- *"European Planning and Policies for Forest Fires"* (Athens, October 2004). The main aim of the workshop was to identify the causes of the devastating large-scale forest fires of summer 2003 in Europe (*FFNet No 2).*
- *"Air quality monitoring in the field and personal protective equipment in big forest fire incidents: a state of the art and beyond"* (Paris, December 2005). The workshop was meant to be a sampler of cutting-edge technologies for air-quality monitoring in emergency situations (*FFNet No 4).*
- *"Human Rights in Disasters: Search and Rescue Operations in Disasters especially for vulnerable people"* (Athens, November 2009). The aim of the workshop was to develop a network of people and organizations which will encourage and reinforce research and development of procedures capable of supporting vulnerable groups in case of a natural disaster. This was a joint effort with the Council of Europe and the National Technical University of Athens, in the framework of the FP7 project " SGL for USaR-Second Generation Locator for Urban Search and Rescue Operations" (http://www.sgleu.org/index.php?option=com_content&view=article&id=11%3Ahuman-rights-in-disasters-workshop&Itemid=7) (*FFNet No 6).*

European University Centre for Cultural Heritage – CUEBC

Ravello, Italy

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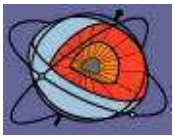
E-mail: univeur@tiscali.it **Web:** www.univeur.org

CREATION
1983

OBJECTIVES
To contribute, in connection with national and international institutions concerned, to carry out a cultural heritage policy from the point of view of expert training and specialisation, scientific advice, as well as protection and promotion of cultural and historical assets.

MAIN ACTIVITIES
The Centre collaborates as a matter of course with professors, researchers and students from all over Europe, and it actively promotes the participation of scientists and students from all European countries. It also co-operates with scholars from other continents. In particular, it includes a program of activities specifically designed for countries on the North African and Middle Eastern shores of the Mediterranean.
From the very beginning the choice was made to deal with cultural heritage only. This choice was made for political and practical reasons, namely the undesirability of concentrating research and training in every discipline in one single country. To achieve the specific aims of a university - i.e. study and research in all fields of knowledge - the Centre follows the unity of culture principle, reasserted at a major congress of scholars held in the early stage of its activity and commonly referred to as the "Spirit of Ravello".
The principle is implemented through the inter-disciplinary method which connects all branches of knowledge. The inter-disciplinary method does not just mean studying from the perspective of the various scientific disciplines involved, but rather using methods, models and tools of different disciplines, and comparing and contrasting the different analytical approaches in order to gain a more exhaustive knowledge. To give one example of many: a seminar on " nature and landscape in Horace" (Venosa, November 8, 1992 - Ravello, September 24-25, 1993) saw literature experts, semiologists, grammarians, archivists, historians, agronomists, botanists, zoologists, chemists, physicists, geographers, town planners, experts in landscape and environment, engineers and hydraulic engineers, illustrate their specific know-how and show how it was possible to achieve valid results in a variety of fields using their specific research methods, thus valuably combining human sciences with natural sciences.
Already this makes the activity of the Centre highly innovative compared with what is carried out by traditional universities, in that its function is not to provide a "graduate" education as such (already adequately given by traditional universities) but <specialisation>, particularly in subjects not always covered by traditional universities.
This in fact complements the work of Universities, by meeting the high demand for inter-disciplinary education and specialisation. Participation in the research projects and courses of the Centre is recognised by various Universities, based upon either specific agreements or independent decisions made by the academic bodies. The European University is also attended by graduates and students for internships and post-graduate research.
Education activities are aimed not only at students in the field of cultural heritage but also at those managing cultural heritage: i.e. officials in charge of programming its protection and promotion and operators who have to monitor its proper use. Thus post-graduate specialisation is vocation-based. New knowledge is then applied in the real world to test its validity and stimulate additional research, and enhances protection and promotion of cultural heritage.



European Centre on Geodynamics and seismology - ECGS

Walferdange- Grand Duché de Luxembourg

CONTACT

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Tel.: +352-33 14 87 1 **Fax:** +352-33 14 87 88
E-mail: info@ecgs.lu **Web:** http://www.ecgs.lu

CREATION

1988

OBJECTIVES

- Promoting research programmes on geodynamics applied to the study of tectonic deformations linked to earthquakes high lightening space techniques;
- Improving contacts between specialists of the various concerned disciplines;
- Providing the Underground Laboratory on geodynamics of Walferdange with scientific and technical equipment necessary for the study of deformations in active areas;
- Undertaking other actions of scientific interest.

MAIN ACTIVITIES

- Days of Geodynamics in Luxembourg
- Specialised Workshops and working meetings

Geodynamics and sismology

- Seismological research (strong movements of the ground, physics of the seismic sources, effects of site, early alert, monitoring of civil infrastructure, etc.)
- Monitoring of active volcanos in Africa
- Radar interferometry and space geodesy
- High precision gravimetry in Luxembourg
- Measurement of the variation of the ice mass in Greenland
- Walferdange: a station of world reference in high precision gravimetry
- Development of the Luxembourg seismic network
- Promotion of sciences among young people and the general public

Euro-Mediterranean Centre on Insular Coastal Dynamics - ICoD

La Valletta, Malta

CONTACT

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CREATION

1988

OBJECTIVES

The objectives of the Centre, which is a non-profit organization created within the framework of the above-mentioned agreement, shall include education, training and research on coastal issues and related hazards in the Mediterranean

MAIN ACTIVITIES

- Coordination of EUR-OPA research on 'Coupling terrestrial and marine datasets for coastal hazard assessment and risk reduction in changing environments'.
- Participation to the EUR-OPA BeSafeNet initiative.
- Risk mapping of vulnerability to sea level rise and Tsunami of selected low lying coastal areas in the Maltese islands and Turkey.
- Meteorological hazards and their impacts in Malta - a review of past, present and projected extreme events.
- Annual Commonwealth Training Course on the Management of Coastal Recreational Tourism.
- Malta bio-geographical trans-boundary insula.

Euro-Mediterranean Centre for Evaluation and Prevention of Seismic Risk - CEPRIS

Rabat, Morocco

CONTACT

Address: Angle avenues des FAR et Allal El Fassi,, BP 8027, Agdal Nations Unies, 10102 Rabat, Maroc

Tel.: + 212 37 56 98 10/ 212 37 77 86 74 **Fax:** + 212 37 56 98 11 / 212 37 77 13 34

E-mail : ceprisrba@cnr.ac.ma **Web:** http://cnr.ac.ma/cepris

CREATION

1995

OBJECTIVES

Seismotectonic research at regional level and evaluation of uncertain factors and seismic risk in the countries of the Western Mediterranean (Algeria, Italy, Morocco, Portugal, Spain and Tunisia), in co-operation with their seismological centres and the Agreement's specialised centres, and in consultation with the Civil Defence Directorate, the ministerial departments involved in risk management and academia.

MAIN ACTIVITIES

- Historical and instrumental seismicity catalogue: creation and updating of an interactive seismic database;
- Regional cartography: preparation of seismic and seismotectonic maps;
- Seismic risk: development of approaches for exploring the available historical and seismotectonic data and for evaluating current seismic risk;
- Study and evaluation of the possibility of tsunamis on the Moroccan coastline.

At national level

Contribution to seismic emergency management at national level; Seismic auscultation of major dams for the Directorate of Hydraulic Installations.

Seismic monitoring and study of the Strait of Gibraltar region for SNED company, in charge of the plan to construct the fixed link between Africa and Europe;

Contribution to renew and extend the present seismic system via a new-generation VSAT digital seismic system to provide monitoring and seismic alerts in real time;

Contribution to the extension of the accelerograph system set up at the sites of major structures throughout the country for a better urban expansion planning and civil engineering works;

Contribution to the installation of a new system of permanent GPS stations to show stresses and movements in the Earth's crust and of tide gauges for real time monitoring of sea level as a contribution to monitor and warn of tsunamis.

At international level

Contribution to the tsunami early warning and mitigation system in the North-Eastern Atlantic and the Mediterranean (UNESCO's Intergovernmental Oceanographic Commission); Contribution to European Commission scientific programmes implementation relating to seismic and tsunami risks.

Research fields

Historical seismicity and macroseismicity, instrumental seismicity, surface geology, seismotectonics and palaeoseismicity, seismic micro-zoning and seismic refraction techniques, uncertain seismic factors and seismic zoning, seismic risk, structure vulnerability and analysis, soil-structure interaction, tsunami risk. Discrimination of seismic signals; applications to seismic risk reduction studies.

Seismic micro-zoning of the urban centre of Sidi Bou Afif-Al Hoceima to better evaluate seismic risk. Study of seismic and earthquake-induced landslides risks in the region.

Seismic risk reduction programme in various regions and cooperation with the Ministry for Regional Planning, Environment, Urban Planning and Housing to improve urban areas management.

Training

Co-operation with the Faculty of Sciences of Ibn Tofaïl University (Kénitra): doctorate in "Exploration geophysics and the environment" and Masters "natural hazard analysis and management". Training for trainees on seismology; courses on seismological instruments.

European Centre for Mitigation of Natural Risks – ECMNR

Chisinau, Moldova

CONTACT
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CREATION
1999

OBJECTIVES
Our Centre's mission is to reduce natural risks as a central element of sustainable development and stability, by means of developing the legislative, scientific and educational basis with respect to risk prevention, reaction and assistance, mobilizing and concentrating in this respect the efforts of the scientific community in order to contribute to risk management improvement, to promote local, national, regional and international co-operation in four priority fields: education and training, comparative analysis and legislative harmonization, scientific research and expertise.

MAIN ACTIVITIES
Training
Specialized course in the field of natural risk reduction for various social classes, in particular pre-school and school age children, in collaboration with the Ministry of Education, Youth and Sport, aiming at preparing the participants (especially children) for natural risk protection

- Elaboration of an academic curriculum in collaboration with the Institute of Sciences for the training of didactic and managerial staff from pre-university establishments in the field of protection of children against natural risks, which finalized with a seminar with the topic "Didactic staff training aspects in the field of flood protection".
- Specialized courses on the psychological aspects of natural risk prevention.
- Elaboration of didactic, training and methodological materials for pre-university and university establishments. These materials come to support children awareness improvement programmes in the field of natural risk prevention. In this context the Centre has organized multiple scientific workshops and conferences, the last one being the international scientific and practical conference on "Anti-risk training in the concept of school education", organized with the support of the Ministry of Education, Youth and Sport of the Republic of Moldova and the Institute of Sciences, with the participation of scientists from scientific research institutions, university and practical establishments from Moldova, Romania and Ukraine.

Research activities
They are carried out in co-operation with other European specialized centres and other international organisations

- Scientific "Study of flood problems in the Republic of Moldova", which analyzed and generalized the national and Euro-Asian experience in the field of risk assessment and worked out flood monitoring programs, modern information technologies on flood risk management and mitigation, the content and flood risk quantitative index, flood risk monitoring.
- Study on the analysis of local natural risk management legislation and its harmonization with international standards. The study mainly aims at creating a common legal space that could facilitate the risk management decision-making process in Europe.

Others
Annual competition of children drawings on the theme "Protection in the event of flood in the view of children", with the participation of children of I-XII forms.

- Project on gathering and analysing the information on the present national systems of toxic waste management according to the European Union policies, in co-operation with other specialized centres.
- Expertise and consultancy in the field of natural risk management and prevention.
- Creation of a specialized library and database.
- Provision of information of legal and insurance character. Issue of publications, references, informative reports, handbooks, guidance and other.

European Centre on Urban Risk – CERU

Lisbon, Portugal

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Tél.: + 351 213921873 **Fax:** + 351 217942572
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CREATION
1999

OBJECTIVES
Definition of a unified strategy and of a common frame to co-ordinate the different activities performed on the technical and scientific research, in the urban risks domain.

MAIN ACTIVITIES
Training
- *Organisation of training courses to formers*
  These courses, of one or two weeks of duration, are offered once every two years. They will be directed to a restricted group of about 30 people, selected from new graduate students, university assistants, civil protection technicians and other specialists related with the security in case of disaster.

Research
- *Organisation of workshops and conferences*
  These workshops and conferences have their objectives defined in Agreement with the activity plan proposed by the administration of the CERU, and are composed by thematic meetings of urban risks specific areas.
- *Organisation of seminars concerning the public information and training*
  Directed to several sectors of the economic, social and political life (such as the health, the transportation, the insurance companies, the social communication, the modern top industries, the representative associations or institutions of the citizens, etc.), they are an enlarged forum of discussion related with the prevention measures diffusion and the emergency protection and management.
- *Preparation of specialised publications*
  The diffusion of the achieved results on the technical and scientific research in the urban risks domain is considered also as a priority area of the CERU intervention.

Others
- *Organisation of a specialised library*
  A library will be organised, concentrating the set of produced publications in the research work performed in the scope of the CERU, as well as by other existing documents in this domain. Different texts, papers, books, journals, etc. will be collected and catalogued.

European Centre for Rehabilitation of Buildings – ECBR

Bucharest, Romania

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CREATION
2003

OBJECTIFS
The existing building stock in Romania and in many countries of Europe has various age, comfort and structural safety and reliability.
The change of occupancy of buildings during the building lifespan, the cumulative structural damage produced by natural hazards and the upgrading of knowledge, standards and materials used for design of buildings and their technical equipment make the rehabilitation of buildings a major challenge for contemporary society in Europe.
Romania has adopted in the last years several national laws requesting and supporting the identification and the strengthening of buildings vulnerable to earthquakes as well as the upgrading of thermal comfort of buildings.

MAIN ACTIVITIES
The Centre should search and should perform activities devoted to rehabilitation of buildings at the national, regional and European levels, as well as to earthquake education of the citizens. The Centre intends to perform technical activities devoted to:

- Contributing to preparation of appropriate legislation for buildings rehabilitation and risk mitigation by MRDT;
- Strengthening of the building structures damaged by earthquakes;
- Mitigation of natural disaster risks, including earthquake education;
- Rehabilitation of the building comfort and building equipment, associated with the ;
- Other activities related to the hazard, vulnerability and risk management.

The Centre benefits from the facilities of existing laboratories in the INCERC Bucharest Branch and cooperates with universities.
The Centre promotes partnership with specialized institutions, agencies and authorities related to building design and building rehabilitation from Romania, UE and world-wide.

European Centre for new technologies of risks management - ECNTRM

Moscow, Russian Federation

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E-mail: vniigochs@vniigochs.ru **Web:** www.vniigochs.ru

CREATION
1993

OBJECTIVES
Scientific and methodological maintenance of actions on safety protection of people and territories in emergency situations.

MAIN ACTIVITIES
- Organization and execution of scientific and research work.
- Development of educational methodological manuals for the students on safety issues and protection of the population.
- Development of methods, means and ways of people protection and hazards management.
- Development of technical requirements to rescue means. Creation of geoinformation systems.

European Centre for Disaster Medicine – CEMEC

San Marino

CONTACT

Address: Ospedale di Stato Via Scialoja 1 - 47893 Cailungo - Repubblica di San Marino
Tél.: 378 0549 994535 **Fax:** 378 0549 90 37 06
E-mail: cemec@iss.sm **Web:** http://www.sanmarinosalute.sm

CREATION

1987

OBJECTIVES

Promoting and developing training and research in the field of disaster medicine aimed at health personnel and volunteers involved with emergency situations.
Mitigate the impact of natural and technological disasters on human life.
The CEMEC shall pursue its objective, inter alia, by the following activities:

- Designing and supporting standardised teaching programmes suitable for all trainees in Europe ranging from the lay public to the qualified healthcare professional.
- Promoting and co-ordinating appropriate research.
- Organising relevant congresses and other scientific meetings.
- Promoting political and public awareness of disaster medicine
- Promoting exchanges among different healthcare professional disciplines.
- Advising relevant European and other national and international bodies on all matters related to disaster medicine

MAIN ACTIVITIES

Educational and Training activities

CEMEC organizes courses on emergency and disaster medicine on a regular basis; most courses are run in co-operation with national and international associations and organizations as for example:

- European Resuscitation Council
- Italian Resuscitation Council
- American Academy of Clinical Toxicology
- Europe Advanced Hazmat Life Support Programme
- Catholic University School of Medicine, Rome
- NIKIFOROV Russian Centre of Emergency and Radiation Medicine, EMERCOM, St. Petersburg

Different learning outcomes are covered by many types of courses:

- Advanced Adult Life Support (ALS)
- European Paediatric Life Support (EPLS)
- Intermediate Life Support (ILS)
- Advanced Hazmat Life Support (AHLS)
- Emergency NBCRE
- Qualification in health legislation and emergency medical systems
- Psychological aspects of emergencies and disasters
- Nuclear Accidents: veterinary and medical aspects and management
- Toxicological Basic Support and Therapy
- Advanced Management of Mass Casualties and maxi-emergencies
- Coronary Life Support
- Acute and Chronic Toxicity of urban solid waste

Research activities

In co-operation with other European specialised centres and international organisations.

- *Child Trauma Network* (with Spain, Algeria, Morocco, France, Belgium, Lebanon and Tunisia) on psychological and psychiatric help to children affected by emergency situations.
- Tox.it web site (www.tox.it) dedicated to toxicological aspect of emergencies and disasters.

European Center on Social Research in Emergency Situations – CEISE

Madrid, Spain

CONTACT
Address: Quintiliano, 21. 28002 Madrid (Spain)
Tel.: (34) 91 5373100 / 287 **Fax:** (34) 91 5628926
E-mail: agarcia@procivil.mir.es **Web:** www.proteccioncivil.es

CREATION
1988

OBJECTIVES
- Promote and develop researches and sociological legal and economic studies in the field of civil protection.
- Maintain the functions attributed previously to the European Centre on Technical information of the Population in Emergency situations, functions covering numerous aspects on emergency situations management but also analysis and risk prevention which require for their comprehension and solution human sciences aspects (psychology, sociology, economy, legal sciences, education sciences, etc.).

MAIN ACTIVITIES
Teaching of topics related to communication and population's behaviour in several courses of the ENPC-DGPC
- In collaboration with ENRESA and the International University Menéndez Pelayo on social aspects of the nuclear risk in liaison with a course in the UIMP of La Coruña carried out in Julio 2004
- CEISE prize for the doctoral thesis on social and legal aspects applied to civil protection Ecological catastrophe and political crisis: public opinion and opinion published on the case Prestige, work in co-operation with the University of Coruña on advice for innovation, industry and business of the Xunta de Galicia and the Ministry for sciences and technologies Design and co-ordination of periodical enquiry analyses (2 per year) such as "bus" for ENRESA: "Acceptability and information degree of the Spanish population in the field of energy"
- Summary of CEISE works and seminars from 1987 to 2003 to be edited
- Coordination of INFOCEISE, and Iberian American forum and permanent meetings (via internet)

European Centre on Vulnerability of Industrial and lifelines systems - ECILS

Skopje, "the former Yugoslav Republic of Macedonia"

CONTACT

Address: Institute of Earthquake Engineering and Engineering Seismology, University "St. Cyril and Methodius" - Salvador Allende St. 73, P.O. Box 101, 1000 Skopje, "the former Yugoslav Republic of Macedonia"
Tel: (+389 2) 3107 701 **Fax:** (+389 2) 31 12 163
E-mail: ecils@pluto.iziis.ukim.edu.mk **Web:** http://www.iziis.ukim.edu.mk/ecils

CREATION

1997

OBJECTIVES

Promotion of programs for theoretical and applied research of the urban vulnerability associated with the physical (sanitary: water, waste water and solid waste disposal; power: electric power, natural gas and liquid fuel; transportation: highway and railway; and information and communication), social (health care, education) lifelines and industrial systems;
Strengthening of the cooperation between local and national authorities, industry and research institutions for rational planning of measures for reduction of natural hazards' consequences caused by physical damage or functional interruption of physical and social lifelines and industrial systems;
Improvement and further development of experimental research facilities, strong motion instrumentation and monitoring of physical lifeline and industrial systems, especially those located in seismically active regions;
Promotion of the international cooperation through organization of joint research projects, conferences, symposia, workshops and seminars in the field of vulnerability of lifelines and industrial systems;
Promotion of public awareness on problems related to vulnerability of lifelines and industrial systems, mitigation policies and measures, development and promotion of risk prevention culture;
Dissemination of relevant results and information.

MAIN ACTIVITIES

Training

Ensure participants from eligible EUR-OPA MHA Countries for 12 week training course in Earthquake Engineering and Engineering Seismology (CADAC).

Research

Seismic Monitoring/Research
- Seismic monitoring of lifeline systems and industrial facilities components
- Monitoring of the Vardar seismic zone in Republic of Macedonia
- Paleoseismological study in Macedonia for the need of seismic hazard analysis

Seismic Vulnerability and Reliability of Physical Lifeline Systems
- Behaviour of pipeline systems in seismic environment
- Estimation of seismic vulnerability of industrial facilities based on resonant concept
- Seismic reliability evaluation of electric transmission high voltage lines

Seismic Prevention and Preparedness of Social Lifeline Systems
- Capacity of health care system in post disaster conditions
- Short to medium term priorities and actions for protection of health care system buildings based on their existing seismic resistance and safety
- Short to medium term priorities and actions for protection of educational system buildings based on their existing seismic resistance and safety
- Risk assessment tools for diagnosis of urban areas

In progress
- Earthquake Protection of Historical Buildings by Reversible Mixed Technologies – PROHITECH
- Application of High Tech Strengthening Methodology on Historical Monuments
- Amplification and Seismic Vulnerability of Buildings in Macedonia, Croatia and Slovenia
- Cost-Benefit Analysis of Base Isolated Vital Structures

European Natural Disasters Training Center – AFEM

Ankara, Turkey

CONTACT
Address: Başbakanlık Afet ve Acil Durum Yönetimi Başkanlığı
AFEM - Avrupa Dogal Afetler Egitim Merkezi
Eskişehir Yolu 10. km Lodumlu 06530 / Ankara / TÜRKİYE
Tel: + 90 312 220 13 57 / 13 57 **Fax:** + 90 312 285 98 45
E-mail: kaan.aklar@afad.gov.tr / erkan.doganay@afad.gov.tr / afem@afad.gov.tr

CREATION
1988

OBJECTIVES
Training of Technical Staff for Natural Disasters, Public Awareness against disasters

MAIN ACTIVITIES
AFEM organises training courses especially for technical staff, campaigns for public awareness, gives support for disaster affairs.

European Centre of Technological Safety – TESEC

Kiev, Ukraine

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Address: Ukraine, 03164, Kyiv-164, General Naumov., 13
Tel.: (38 044) 4238148, (38 044) 4520678 **Fax:** (38 044) 4238148
E-mail: poyarkov@i.kiev.ua **Web:** www.tesec-int.org

CREATION
1996

OBJECTIVES
- Join efforts and scientific potential of worldwide scientific, research and technological centres and laboratories in designing technical means and technologies;
- Define a risk assessment approach of potentially dangerous activities and to conduct prevention measures of extraordinary technological situations and effective response activities;
- Establish a reliable mechanism to attract the world community to conduct scientific-technological research works in enterprises with a high industrial risk level in Ukraine;
- Establish the partners and business contacts among Ukrainian scientists and research institutions and leading world scientific research centres and laboratories;
- Create a reliable integration mechanism of applied science in Ukraine in the field of technological safety into the world scientific community;
- Coordinate methodological, technical and financial help in the field of technological safety;
- Provide effective implementation of the international co-operation and assistance programs on forecasting and response to extraordinary situations, such as Chernobyl disaster consequences.

MAIN ACTIVITIES
The Chernobyl accident implied changes worldwide: new standards on radiation protection, revised nuclear national strategies, increased nuclear safety and radioactive waste management.

Lessons learned from Chernobyl
The Centre has prepared reports for the Ministry of Emergencies and of national seminars and co-organized the International conferences in Kiev on environmental, medical and social consequences:
"15 years after the Chernobyl Accident. Lessons Learned" (2001): 17 countries
"20 years after Chernobyl accident. Future Outlook" (2006): 25 countries
"25 Years after Chernobyl Accident. Safety for the Future" (2011): 43 countries

Population awareness
The International workshop *"Public authorities and civil society together for a safe European nuclear future: the role of local communities, authorities and central governments in emergency preparedness and management"* (2008) and the follow-up meeting with European Associations of Municipalities with Nuclear Facilities *"Foster better radiological protection and information for populations living in areas that might be affected in the case of an nuclear or radiation accident"* (2009) promoted a network to foster radiological protection and information for population.
Following the unjustified fear of general public in Europe concerning exposure to Fukushima accident releases, a project on "Nuclear Hazard Basic Knowledge: lessons from Chernobyl and Fukushima" was launched in 2011 with the support of the Agreement and UNESCO to provide better information and protection for people based on basic knowledge on radiological hazard enabling to build their own capability for risk assessment.

Radiological monitoring
An international Summer School on *"Post-accidental Radiation Monitoring Techniques"*, organized annually since 1997, provides training to emergency workers, decision-makers, graduate students, university faculty, and scientist interested in emergency preparedness and response, radiation protection and risk assessment. It covers: post-accidental radiation monitoring techniques; accidental dose assessment; decision making in case of radiological accident. *Methods and Procedures for Post-accident Radiation Monitoring* had also been developed and tested in 1999 – 2003.

References

Experiences of landslide susceptibility and hazard mapping

1. Béguería, S., van Asch, Th.W.J., Malet, J.-P., Gröndahl, S. 2009. A GIS-based numerical model for simulating the kinematics of mud and debris flows over complex terrain. Natural Hazards and Earth System Sciences, 9, 1897-1909.
2. Castaldini, D., Ghinoi, A. 2007. Geomorphological hazards affecting main productive areas in the mountain basin of the Panaro River (Modena Apennines, Italy): a Case Study. Analele Universitatii din Oradea, Seria Geografie, tom. XVII, Editura Universitatii din Oradea 2007, ISSN 1221-1223, pp. 11-20.
3. Günther, A., Van Den Eeckhaut, M., Reichenbach, P., Hervás, J., Malet, J.-P., Foster, C., Guzzetti, F. 2011. New developments in harmonized landslide susceptibility mapping over Europe in the framework of the European Soil Thematic Strategy. In: Margottini, C., Canuti, P. Sassa, K. (Eds): Proceedings of the Second World Landslide Forum, 3-7 October 2011, Rome, Italy, Springer (to be published in 2012).
4. Heinimann, H.R., Holtenstein, K., Kienholz, H., Krummenhacher, B., Mani, P. 1998. Methoden zur Analyse und Bewertung von Naturgefahren. Umwelt-Materialien Nr. 85, Naturgefahren, BUWAL, Bern, 248 pp.
5. Malet, J.-P., Puissant, A., Mathieu, A., Van Den Eeckhaut, M., Fressard, M. (submitted). Landslide susceptibility assessment at 1:1M scale for France. Landslides, 15p. (submitted in July 2011).
6. Panizza, M., Corsini, A., Marchetti, M., Pasuto, A., Silvano, S., Soldati, M. 2004. Cartographie du risque de mouvements de terrain au Tyrol du Sud. In: Y. Veyret, G. Garry & N. Meschinet de Richmond (eds.), Risques naturels et aménagement en Europe. Armand Colin, Paris, pp. 131-142.

Legislation and local authorities

1. Draft Recommendation on Local and Regional Authorities Preventing Disasters and Facing Emergencies (APCAT(2006)24, European and Mediterranean Major Hazards Agreement)
2. Involvement of local and regional authorities in major hazard management (APCAT(2010)8, European and Mediterranean Major Hazards Agreement) http://www.coe.int/t/dg4/majorhazards/ressources/Apcat2010/APCAT2010_8_analyseLegislationFinale_EN.pdf

Forest Fires and Smoke or New Forest Fire Threats

1. Genualdi, S. (2008) Semi-volatile organic compounds as molecular markers for atmospheric and ecosystem transport. Dissertation submitted to Oregon State University in partial fulfillment of the requirements for the degree of Doctor of Philosophy. Presented: 18 September 2008. http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/9463/Genualdi_final_thesis_pdf.pdf?sequence=1
2. Goldammer, J.G. (2010) Preliminary Assessment of the Fire Situation in Western Russia. Analysis of 15 August 2010, presented at the State Duma, Moscow, 23 September 2010. International Forest Fire News No. 39, 20-42. Online publication: http://www.fire.uni-freiburg.de/intro/about4_2010-Dateien/GFMC-RUS-State-DUMA-18-September-2010-Fire-Report.pdf
3. Goldammer, J.G., M. Statheropoulos, and M.O. Andreae. 2009. Impacts of Vegetation Fire Emissions on the Environment, Human Health and Security – A Global Perspective. In: Wildland Fires and Air Pollution (A. Bytnerowicz, M. Arbaugh, A. Riebau, and C. Andersen, eds.), 3-36. Elsevier B.V., Developments in Environmental Science, Vol. 8. DOI:10.1016/S1474-8177(08)00001-6. ISBN 978-0-08-055609-03; ISSN 1474-8177.
4. Hohl A., A. Niccolai, C. Oliver, S. Zibtsev, J.G. Goldammer, M. Petrenko, and V. Gulidov (2012) The human health effects of radioactive smoke from a catastrophic

wildfire in the Chernobyl Exclusion Zone: A worst case scenario. Earth Bioresources and Life Quality (in press)
5. Korontzi, S., McCarty, J., Loboda, T., Kumar, S., Justice, C.O. (2006) Global distribution of agricultural fires in croplands from 3 years of Moderate Resolution Imaging Spectroradiometer (MODIS) data. Global Biogeochemical Cycles 20, GB2021.
6. Pausas, J.G., and S. Fernández-Muñoz (2011) Fire regime changes in the Western Mediterranean Basin: from fuel-limited to drought-driven fire regime. Climatic Change, DOI 10.1007/s10584-011-0060-6.
7. Statheropoulos, M., and J.G. Goldammer (2007) Vegetation Fire Smoke: Nature, Impacts and Policies to Reduce Negative Consequences on Humans and the Environment. A Publication of the Council of Europe, Directorate of Culture and Cultural and Natural Heritage, prepared in the frame of the European Open Partial Agreement on the Prevention, Protection Against and Organization of Relief in Major Natural and Technological Disasters – EUR-OPA Major Hazards Agreement as a contribution to the 4th International Wildland Fire Conference, Sevilla, Spain, 13-17 May 2007. http://www.fire.uni-freiburg.de/sevilla-2007/Council-Europe.pdf
8. Turetsky, M.R., Harden, J.W., Friedli, H.R., Flannigan, M.D., Payne, N., Crock, J., Radke, L.F. (2006) Wildfires threaten mercury stocks in northern soils. Geophys. Res. Lett. 33, L16403, doi:10.1029/2005GL025595.
9. Xanthopoulos, G. (ed.) 2004. Forest Fires in the Wildland-Urban Interface and Rural Areas in Europe: An integral planning and management challenge". Volume of Proceedings of International Workshop held 15-16 May 2003, Athens, Greece, under the framework of the EU-funded project „Wildland-Urban Area Fire Risk Management" (WARM). Mediterranean Agronomic Institute of Chania (MAICh), 239 pp. http://www.fria.gr/WARM/warmProceedings.htm
10. Xanthopoulos, G. (2008) Forest Fires in Greece 2007. Int. Forest Fires News No. 37, 2-17.

Climate Change and Cultural Heritage

1. P. Brimblecombe & C. M. Grossi, 2008: Millennium-long recession of limestone facades in London, Environ. Geol., 56, 463–471.
2. P. Brimblecombe & C. M. Grossi, 2009: Millennium-long damage to building materials in London, Science of the Total Environment, 407, 1354-1361.
3. C. Sabbioni, P. Brimblecombe & M. Cassar, (edit.), 2010: The Atlas of climate change impact on European cultural heritage, Anthem Press (Publ.), 160 p.
4. J. Leissner, 2011: L'impact du changement climatique sur les bâtiments historiques et les biens culturels, L'UNESCO aujourd'hui, 3, p. 44-45.
5. C. Sabbioni, P. Brimblecombe, M. Cassar & R.-A. Lefèvre, 2008 : Vulnérabilité du Patrimoine culturel au changement climatique, Rapport au Conseil de l'Europe, AP/CT 44, 26 p.
6. R.-A. Lefèvre & C. Sabbioni, (edit.), 2010: Climate Change and Cultural Heritage, Proceedings of the Ravello International Workshop, 14-16 May 2009, and Strasbourg European Master-Doctorate Course, 7-11 September 2009, Edipuglia (Publ.), Bari, 201 p.

Earthquakes and Historical Cities

1. Vlachos A. (In Greek) (1998). "Thucydides' history of the Peloponnesian war". Edited by Estia.
2. Clayton, P. A. and Price, M. J. (1990). The seven wonders of the ancient world. Routledge.
3. Galanopoulos, A. (In Greek) (1956). "The seismic risk in Athens". Praktika Akadimias Athinon, 31, pp. 464-472.
4. Makris, N. (2011). "Seismic response of free-standing monolithic and multidrum columns of ancient monuments". ECPFE Seminar on the Protection of the Integrity of Monuments Under Seismic Actions, Thessaloniki, November, 2011.

5. Sbeinati, M. R., Darawcheh, R. and Mouty, M. (2005). "The historical earthquakes of Syria: An analysis of large and moderate earthquakes from 1365 B.C. to 1900 A.D.". Annals of Geophysics, 48 (3), pp. 347-435.
6. Ambraseys, N. N. (2001). "The Earthquake of 1509 in the Sea of Marmara, Turkey, Revisited". Bulletin of the Seismological Society of America, 91 (6): 1397.
7. Bein, A. (2008). "The Istanbul earthquake of 1894 and science in the late Ottoman Empire", Middle Eastern Studies, 44:6, pp. 909-924.
8. Finkel, C. F. and Ambraseys N. N. (1997). "The Marmara sea earthquake of 10 July 1894", Anatolia Moderna, VII, pp. 50–54.
9. Gutscher, M.-A., Baptista, M. A. and Miranda, J. M. (2006). "The Gibraltar Arc seismogenic zone (part 2): Constraints on a shallow east dipping fault plane source for the 1755 Lisbon earthquake provided by tsunami modelling and seismic intensity". Tectonophysics, 426, pp. 153–166.
10. Wikipedia (2011). 1509 Istanbul earthquake, 1908 Messina earthquake, downloaded 21/12/11.
11. Koumousis V. (2009). In transcript of "Before the unthinkable … happens again: An international roundtable discussion on the need for seismic mitigation research and applications for cultural heritage", Tokyo. International Institute for Conservation of Historic and Artistic Works. http://www.iiconservation.org/sites/default/files/dialogues/seismic-en.pdf downloaded 22/02/12.

Disaster Medicine Training

1. Joint Commission on Accreditation of Health Care Organizations. Sentinel Event Alert *July 21, 2004.p.30.*
2. Kohn L, Corrigan J, Donaldson M, eds. *To Err Is Human: Building a Safer Health System.* Washington, DC: Committee on Quality of Health Care in America, Institute of Medicine. National Academies Press; 2000.
3. Davidson IJ, Yoo MC, Biasucci DG et al. Simulation Training in Vascular Access Interventions. *J Vasc Access 2010 Jul-Sep; 11(3): 181-90. Review.*
4. Gaba DM, HowardSK, FishKJ et al. Simulation-based training in anestesia crisis resource management (ACRM); a decade of experience. *Simulation and Gaming 2001; 32: 175–193*
5. Reader T, Flin R, Lauche K, Cuthbertson BH. Non-technical skills in the intensive care unit. Br J Anaesth. 2006 May;96(5):551-9. Epub 2006 Mar 27.
6. Savoldelli GL, Naik VN, Park J, Joo HS, Chow R, Hamstra SJ. Value of de briefing during simulated crisis management: oral versus video-assisted oral feedback. *Anesthesiology 2006 Aug; 105(2): 279-85.*
7. Leape LL. Error in medicine. JAMA 1994; 272:1851–1857.
8. Leape LL. The preventability of medical injury. In: Human Error in Medicine. Bogner MS, ed. Hillsdale, NJ: Lawrence Erlbaum Associates, 1994.
9. Argyris C, Putnam R, Smith DM. Action science: Concepts, methods and skills for research and intervention. San Francisco: Jossey-Bass, 1985.
10. Weisinger H. The Critical Edge: How to Criticize Up and Down Your Organization and Make it Pay Off. New York: Little Brown and Company, 1989.
11. Weisinger H. The power of positive criticism. New York: AMACOM, 2000.
12. Scho¨n D. The Reflective Practitioner. New York: Basic Books, 1983.
13. Walker M PJ. Teaching in theatre. Rickmansworth, UK: Manticore Europe Limited 1998
14. Bullock I. Skill acquisition in resuscitation. Resuscitation 2000;45:139-143
15. Lake FR and Hamdorf JM. Teaching on the run tips 5: teaching a skill. MJA 2004;181:327-328
16. Resuscitation Council (UK). Advanced life support. London, Resuscitation Council (UK), 2006
17. Dauphinee WD, Wood-Dauphinee S. The need for evidence in medical education: the development of best evidence medical education as an opportunity to inform,

guide and sustain medical education research. Academic Medicine 2004;79:925-930.
18. Barelli A, Scapigliati A. The four-stage approach to teaching skills: the end of a dogma ? Resuscitation. 2010 Dec;81(12):1607-8.
19. Moorthy K, Munz Y, Adams S, Pandey V, Darzi A. A human factors analysis of technical and team skills among surgical trainees during procedural simulations in a simulated operating theatre. Ann Surg. 2005 Nov;242(5):631-9.
20. Aggarwal R, Undre S, Moorthy K, Vincent C, Darzi A.The simulated operating theatre: comprehensive training for surgical teams. Qual Saf Health Care. 2004 Oct;13 Suppl 1:i27-32
21. Lighthall GK, Barr J, Howard SK, Gellar E, Sowb Y, Bertacini E, Gaba D. Use of a fully simulated intensive care unit environment for critical event management training for internal medicine residents. Crit Care Med. 2003 Oct;31(10):2437-43.
22. Thompson S, Neal S, Clark V. Clinical risk management in obstetrics: eclampsia drills. BMJ. 2004 Jan 31;328(7434):269-71.
23. Thomas EJ, Sherwood GD, Mulhollem JL, Sexton JB, Helmreich RL.Working together in the neonatal intensive care unit: provider perspectives. J Perinatol. 2004 Sep;24(9):552-9
24. Finer NN, Rich W. Neonatal resuscitation: toward improved performance. Resuscitation. 2002 Apr;53(1):47-51.
25. Savoldelli GL, Naik VN, Park J, Joo HS, Chow R, Hamstra SJ. Value of de briefing during simulated crisis management: oral versus video-assisted oral feedback. *Anesthesiology 2006 Aug; 105(2): 279-85.*
26. Leape LL. Error in medicine. JAMA 1994; 272:1851–1857. 3
27. Leape LL. The preventability of medical injury. In: Human Error in Medicine. Bogner MS, ed. Hillsdale, NJ: Lawrence Erlbaum Associates, 1994.
28. Argyris C, Putnam R, Smith DM. Action science: Concepts, methods and skills for research and intervention. San Francisco: Jossey-Bass, 1985.
29. Weisinger H. The Critical Edge: How to Criticize Up and Down Your Organization and Make it Pay Off. New York: Little Brown and Company, 1989.
30. Weisinger H. The power of positive criticism. New York: AMACOM, 2000.
31. Scho¨n D. The Reflective Practitioner. New York: Basic Books, 1983.
32. Torbert WR. Learning from experience: Toward consciousness. New York: Columbia University Press, 1972.
33. Senge PM. The Fifth Discipline: The Art and Practice of the Learning Organization. New York: Doubleday, 1990.

Psychological Support After Disasters References

1. Bisson, J.I. (2008). Using evidence to inform clinical practice shortly after traumatic events. *Journal of Traumatic Stress*, 21(6), 507-512.
2. Bonanno, G.A., Brewin, C.R., Kaniasty, K., & La Greca, A.M. (2010). Weighing the costs of disaster: Consequences, risks, and resilience in individuals, families, and communities. *Psychological Science,* 11(1), 1-49.
3. Council of Europe (2010). *Lessons Learned in Psychosocial Care After Disasters*. EUR-OPA, Council of Europe.
4. Dyregrov, A., Straume, M. & Saari, S. (2009) Long-term collective assistance for the bereaved following a disaster: A Scandinavian approach. *Counselling and Psychotherapy Research, 9*, 33-41.
5. Dyregrov, A., & Yule, W. (2006*).* A review of PTSD in children: A commissioned review. *Child and Adolescent Mental Health, 11*, 176–184.
6. Reyes, G. & Elhai, J.D. (2004). Psychosocial interventions in the early phases of disasters. *Psychotherapy: Theory and Practice, 41(4),* 399-411.
7. Rubonis, A.V., & Bickman, L. (1991). Psychological impairment in the wake of disaster: the disaster psychopathology relationship. *Psychological Bulletin*, 109, 384-399.
8. Saari, S. (2005) *A Bolt from the Blue: Coping with Disasters and Acute Traumas*. Jessica Kingsley Publishers, London and Philadelphia.

9. Sümer, N., Karanci, A.N., Kazak Berument, S., & Güneş, H. (2005).Personal resources, coping self-efficacy and quake exposure as predictors of psychological distress following the 1999 Earthquake in Turkey. *J. of Traumatic Stress*, 18(4), 331-342.
10. Vernberg, E.M., Steinberg, A.M., Jacobs, A.K., Brymer, M.J., Watson, P.J., et al. (2008). Innovations in disaster mental health: Psychological first aid. *Professional Psychology: Research and practice,* 39(4), 381-388.
11. Yule, W. (2006). Theory, training and timing: Psychosocial interventions in complex emergencies. *International Review of Psychiatry*, 18(3), 259–264.
12. Report of the EFPPA Task Force on Disaster and Crisis Psychology, 2001
13. Reyes, G. (2006). International disaster psychology: Purposes, principles and practices. In Reyes, Gilbert (Ed); Jacobs, Gerard A. (Ed), (2006). *Handbook of international disaster psychology: Fundamentals and overview (Vol. 1)*, 1-13. Westport, CT, US: Praeger Publishers/Greenwood Publishing Group