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**ACCORD EUROPEEN ET MEDITERRANEEN  
SUR LES RISQUES MAJEURS  
(EUR-OPA)**

**EUROPEAN AND MEDITERRANEAN  
MAJOR HAZARDS AGREEMENT  
(EUR-OPA)**

*RESEAU DES CENTRES EURO-MEDITERRANEENS SPECIALISES DE  
L'ACCORD EUR-OPA RISQUES MAJEURS*

**BILAN DES PROGRAMMES COORDONNES SOUTENUS EN 2006**

*NETWORK OF SPECIALISED EURO-MEDITERRANEAN CENTRES OF THE EUR-OPA MAJOR  
HAZARDS AGREEMENT*

**SUMMARY OF COORDINATED PROGRAMMES BACKED IN 2006**

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# EDUCATION SCOLAIRE / SCHOOL EDUCATION

## **BE-SAFE-NET 2006 – HYDRO-GEOMORPHOLOGICAL RISK (European Centre on Geomorphological Hazards, Strasbourg)**

**TARGET COUNTRIES:** Several Euro-Mediterranean and Eastern countries

**LOCAL COORDINATORS:** Prof. Olivier Maquaire & Dr. Jean-Philippe Malet

**OTHER PARTICIPANTS:** Be-Safe-Net - European Centre for Disaster awareness with the use of the Internet (Nicosia, Cyprus); ECGS - European Centre for Geodynamics and Seismology (Walferdange, Luxembourg)

### **OBJECTIVE OF THE PROJECT**

#### ***Global objectives :***

Cerg members have a long tradition of organizing education and training activities since more than 10 years (Erasmus intensive courses, Formose intensive courses, etc) and several documents (Power Points presentations, CD-Roms, Students Manuals, Thematic maps) have been elaborated that need to now to be synthesized.

Thus, a collaborative work of the Cerg members in 2006 will be to prepare attractive, up-to-date and education-oriented materials for the hydro-geomorphological hazard and risk section of the Be-Safe-Net web-portal. This work will partly be connected to the specific research activity of Cerg for years 2006-2007 'Implementation of didactic materials on geomorphological hazards' Collaborations with other APO Specialized Centres (ECGS, Be-Safe-Net) is foreseen.

#### ***Specific objectives for 2006:***

The workplan to prepare the material end edit it in digital format comprises two steps:

- 1) A meeting of the Cerg members who has experience in the preparation of didactic materials or who can provide specific education materials will be organized in the 2<sup>nd</sup> term of 2006. Participation of Cerg members from Italy, Spain, Portugal, France and Germany is expected. The participants will exchange information, list their potential material and prepare a beta version of webpages. People from the APO Secretary, the BE-Safe-Net Centre of Cyprus and other centres that may be interested by the project will be invited. The meeting will last 2 days.
- 2) Each Cerg member (as well as people from other centres) will then have the responsibility of preparing and editing in a digital format the material in their own language. Delivery date of the material to the BE-Safe-Net Centre of Cyprus will be December 2006. In order to facilitate the preparation of the material, the funding of the 'coordinated programme' will be distributed among the teams of each Cerg members.

### **EXPECTED RESULTS IN 2006**

Implementation of didactic materials on hydro-geomorphological hazards on the Be-Safe-Net webportal, in several languages. The final editing of the prepared documents on the webportal will be in charge of the Be-Safe-Net Centre.

### **ACTUAL RESULTS FOR 2006**

A collaborative work of the CERG members in 2006 has been the preparation of attractive, up-to-date and education-oriented materials for the hydro-geomorphological hazard and risk section of the Be-Safe-Net web-portal. This work is partly connected to the specific research activity of CERG for years 2006-2007 'Implementation of didactic materials on geomorphological hazards' in order to synthesize all the education and training material produced by CERG members since more than 10 years.

The workplan to prepare the material in digital format comprises two steps:

- 1) A meeting of some CERG members and the APO and Be-Safe-Net Members has been organized on 22 and 23 June 2006 at the Human Rights Palace of Strasbourg. CERG members from France, Germany and Italy have attended the meeting. The participants have exchanged information, listed their potential didactic material, and discussed about the structure of the Be-Safe-Net webportal (it was remembered by APO that the website 'clients' are teachers from Secondary Schools willing to present some pedagogical material to their students. In consequence, the words and concepts used in the http pages have to be adapted to this public).  
It has been decided to modify slightly the structure of the Website: i) Add a 'Prevention section' between the 'Information & Education' section and the 'Protect Yourself' section. ii) Skip the 'Gallery' and 'Games' section.

- 2) CERG members experienced in the preparation of didactic materials (from France, Germany, Italy, Portugal, Spain and The Netherlands) or who can provide specific education material have then be contacted. They have the responsibility of preparing the requested material for the 'Landslide' section of the English version of the WebPortal. In a further phase, they will be in charge of translating the English pages in their own language. The work is still on progress, and the delivery date of the material to the CERG Secretary is March 2007. The produced material will then be examined and discussed in occasion of a meeting which will be held at the BE-Safe-Net Centre of Cyprus in the first half of 2007.

**INTERACTIVE EDUCATIONAL MEDIA TO TEACH 6-11 YEAR OLDS ABOUT THE EURO-MEDITERRANEAN COASTAL ENVIRONMENT (*Euro-Mediterranean Centre on Insular Coastal Dynamics, Malta*)**

**TARGET COUNTRIES : International**

**LOCAL COORDINATOR: Dr. Anton Micallef, ICoD**

**OTHER PARTICIPANTS :**

**OBJECTIVE OF THE PROJECT**

***Global objectives :***

Development of age-appropriate interactive modules/media products on aspects of the Euro-Mediterranean coastal environment, having a special emphasis on raising awareness of coast related hazards.

***Specific objectives for 2006:***

The project for 2005 involved the production under the Formose Programme, of text and imagery for a booklet entitled 'Sammy Sand Grain'. This was the first in a series of books that will feature Jack, Jill and Sammy Sand Grain. The books are educational in that they specifically relate to beach processes. All factual information given is correct, and children were introduced to coastal processes through the 'adventures' associated with these three characters. Sammy Sand Grain introduces Jack and Jill to his many 'friends' such as Danny Dune, Peter Pebble and Willy Wave, etc., who exist in the beach environment. Each of these in turn will be the focus of a new book that not only explains the main features of the character, but also emphasises safety issues pertinent to that character. In this first book, swimming and the danger associated with rock falls were emphasised.

**EXPECTED RESULTS IN 2006**

Further to pilot project on Sammy Sand Grain in 2005 (produced in both French and English), it is proposed to expand the project through printing and translation into further languages (Spanish and Turkish) during 2006. During this year, a second booklet in the series will be developed, introducing among other, issues concerning potentially dangerous currents and hazardous litter encountered with the beach / coastal environment.

**ACTUAL RESULTS FOR 2006**

The Spanish and Maltese versions of the first booklet, already existing in English and French, have been printed. The Russian and Arabic versions are ready for printing and will be also available in early 2007. In the mean time, the second booklet is under construction and will be produced in 2007 at least in English and French.

# EDUCATION UNIVERSITAIRE / UNIVERSITY EDUCATION

## **POST-GRADUATE SCHOOL: MULTI-RISK – CONCEPTS TO APPROACH MULTI-HAZARDS (European Centre on Geomorphological Hazards, Strasbourg)**

**TARGET COUNTRIES:** Several Euro-Mediterranean and Eastern countries

**LOCAL COORDINATOR: 2006:** Dr Thomas Glade (CERG executive member), Bonn University

**OTHER PARTICIPANTS:** Higher Institute of Emergency Planning (Florival, Belgium)

### **OBJECTIVE OF THE PROJECT**

#### ***Global objectives:***

To provide high-level training school in the field of hazard and risk management to young European scientists and promote scientific and technological excellence in the science of hazard and risk by organizing a series of two multi-disciplinary high-level schools in 2006 and 2007.

#### ***Specific objectives for 2006:***

Many European regions are not only affected by one potentially hazardous process but by two or more of such processes. For these sites a multi-risk perspective has to be adopted to quantify the total risk in order to accommodate local problems. Objectives of the training school are:

- 1) to gather process and modeling knowledge of a variety of hazardous processes such as earthquakes, landslides (including rock falls and debris flows), snow avalanches, slush flows, and flooding
- 2) to provide and discuss multi-hazard and -risk concepts,
- 3) to enhance understanding of the importance of interdisciplinary collaboration especially within the context of multiple risk assessment of natural hazards.

The high-level school will take place 24-30 September 2006 in Bonn, Germany, at the Department of Geography, University of Bonn. The teaching will be carried out by leading experts in the respective fields. Once approved by the EU, the course will be linked to other associations (e.g. IAG; IGU Working Group on Hazard and Risk; DGfG Working Group on Natural Hazard and Risk). Expected student numbers are 25.

For both high-level schools, the participation of staff member from the APO Specialized Centre ISPU (Higher Institute of Emergency Planning, Florival, Belgium) is expected in order to highlight European rules and legislation in the field of hazard and risk.

Dr. Thomas Glade is the chair of the local organizing committees, and is responsible of the programme of the school as well as the invitation of speakers. He will be supported by local people from their own staff, as well as by the CERG Secretary (Olivier Maquaire, Jean-Philippe Malet) for the financial management.

### **EXPECTED RESULTS IN 2006**

The attendees will gain basic knowledge on current state-of-the-art concepts of addressing multiple hazards and risks endangering a specific region or locality. The basic knowledge includes (a) the principles of sustainable risk management strategies, (b) the procedures and methods to obtain information on hazards and risks, (c) the analytical capability to perform hazard and risk analysis on various temporal and spatial scales, and (d) to link respective results to general land use planning procedures. Field-trips will demonstrate already implemented strategies for characteristic examples.

### **ACTUAL RESULTS FOR 2006**

#### ***Detailed Programme***

Monday, September 25th

- Welcome Address –Setting the Scene (T. Glade)
- Varying concepts and approaches in hazard and risk studies (K. Thywissen)
- Vulnerability assessments: Theoretical frameworks and practical assessments (J. Birkmann)
- Risk zonation within spatial land-use planning (F. Friesecke)

Tuesday, September 26th

- Review of federal governmental strategies and concepts for multiple hazards and risks (P. Lauwe)
- Dynamic run out modelling of slow and rapid moving landslides (T. van Asch)
- Risk Analysis: The evaluation of direct and indirect costs related to landslide activity in the Lisbon area (J. Zezere)
- Integrated Flood Risk Modelling (A. Assmann)

Wednesday, September 27th (FIELD TRIP)

- Earthquake Research Station Bensberg (K.G. Hinzen)

- Flood Protection Agency Cologne (S. Mertsch)
- Thursday, September 28<sup>th</sup> (FIELD TRIP)
- German Federal Institute of Hydrology (P. Krahe)
  - Management of Landslide Hazard: Rhine & Nahe Valley (J. Grunert)
- Friday, September 29<sup>th</sup>
- Snow avalanche hazards within a multi-risk framework (M. Keiler)
  - Some aspects of the December 26<sup>th</sup> 2004 tsunami impact on the northern shore of Sumatra, Indonesia (P. Wassmer)
  - Remote Sensing applications in geohazard reconnaissance, monitoring and disaster management (J. Hervas)
  - The Guil Valley (Alps) Hazards and Risks: Flood Risk coupled with shallow landslides and avalanches (M. Fort)
- Saturday, September 30<sup>th</sup>
- MultiRISK: New concepts within Global Change? (T. Glade)
  - Evaluation of the school (K. v. Elverfeldt)
  - Final discussion round & workshop closure (T. Glade & K. v. Elverfeldt)

There have been two field trips to the surrounding area and expert institutions dealing with natural hazards and risks. The respective material compiled by these institutions can be found on the accompanying CD. *[Annotation: The lecture "Risk zonation within spatial land-use planning" (Frank Friesecke) had to be cancelled due to illness of the lecturer]*

Due to the high number of applications (57), the local organisation committee decided to increase the number of participants from 20 to 25. Still, more than every second application had to be rejected. The selected ten female (42%) and fifteen male (52%) participants stem from twelve European and Non-European countries (of whom 18 participants were from Agreement's member states nationals)

Thanks to the supporting organisations – EUR-OPA, IAG, UNU-EHS, and ZENEB – the organizers were happy to be able to offer nine grants to applicants from Southern Mediterranean and Eastern Europe. Of 39 grant applications, 29 have been eligible and, based on the CV and the personal letter of interest, an especially appointed international committee awarded the nine grants.

Since 2003 courses at the University of Bonn are regularly evaluated by the Centre for Evaluation and Methods (ZEM) which has been founded in 1999. The ZEM kindly provided its infrastructure and evaluated the course on three levels: whole course (organisation, aims); lecturers; field trips. The evaluation results have been very positive for all three levels. The results have been presented and discussed with all participants during the final assembly.

The participants received several teaching documents ("Keynote papers") for the lessons as well as the field trips. Furthermore, all teaching material has been available online on the elearning-platform ("Ecampus") of the University of Bonn for four weeks after the training school. The material for the participants is compiled on a CD-ROM and students have been explicitly told that the electronic documents are for personal use only – a further distribution is strictly forbidden due to copyright issues.

**WORKSHOP ON "COMBINATION RESEARCH AND GLOBAL GEOPHYSICAL FLUIDS" (European Centre for Geodynamics and Seismology, Walferdange, Luxembourg)**

**PAYS CIBLES :** tous les pays de l'Accord

**COORDINATEUR LOCAL:** ECGS

**AUTRES PARTICIPANTS :** Ministères de la Culture, de l'Enseignement Supérieur et de la Recherche du Grand-Duché de Luxembourg

**OBJECTIF DU PROJET**

***Objectifs globaux:***

Les «Workshops» de l'ECGS consacrés aux problèmes les plus divers posés en géodynamique et en séismologie sont organisés depuis 20 ans par l'ECGS et constituent un forum où les participants exposent leurs difficultés et cherchent, en commun, à explorer des voies nouvelles. Cette manifestation se tient chaque année et bénéficie du support du Ministère de la Culture, de l'Enseignement Supérieur et de la Recherche. Chaque workshop donne lieu à une publication scientifique dans la série très recherchée des "Cahiers du

Centre Européen de Géodynamique et de Séismologie”, appelés aussi 'Cahiers Bleus' à cause de la couleur bleue foncée caractéristique de leur couverture. Vingt-quatre volumes ont été publiés à ce jour.

**Objectifs spécifiques pour 2006 :**

The main goal of the workshop will be the improvement of IERS Global Geophysical Fluid Centre (GGFC) products in accuracy, consistency, stability, timeliness, user-friendly access, and documentation, to contribute significantly to the " Global Geodetic Observation System" (GGOS).

The GGFC Special Bureau's (SBs) have the responsibility of supporting, facilitating, and providing services to the scientific research community, the IAG services and common users, in areas related to the variations in Earth rotation, gravity field, geocenter, and surface deformations that are caused by mass transport in the atmosphere-hydrosphere-solid Earth-core system, or the global geophysical fluids.

The rapidly increasing accuracy of space-geodetic observation techniques allows to measure displacements of the Earth surface resulting from surface loads on different spatial and temporal scales. These observations offer the opportunity to validate the geophysical models describing deformations induced by various surface loads, including those due to ocean tides, the atmosphere, and groundwater. Vice-versa to improve the results of space geodetic analyses, increasingly complex geophysical models of station motion are required (as emphasised, e.g., in the IERS Conventions).

To reach such a goal also the IERS conventions and standards for modelling, parameterisation and analysis strategies will have to be considered. In view of the requirements of the new satellite missions and the demanding questions concerning global change and the interaction of the Earth's System, the products of the GGFC, their accuracy and consistency become of more and more importance.

The computed quantities, algorithm and data formats will become standardized and results are documented, archived and made available to the public on dedicated individual SB websites or the IERS Data- and Information System.

The workshop will take an insightful review of what has been reached, and plan for the future while further define the roles and responsibilities in serving the community. It is a quickly evolving environment under ever-increasing requirements on physical reference frames that demand understanding, modelling, and prediction of the global geophysical fluids and their effects on the Earth's rotation, time-variable gravity, geocenter motion, and surface deformations.

A two-day workshop is planned. After technical reports of review and plan from each of the eight Special Bureaus (Atmosphere, Oceans, Hydrology, Tides, Mantle, Core, Gravity/Geocenter, Loading) a technical forum from individuals including SB members/associates and anyone of the community will discuss scientific contributions, viewpoints, concerns and issues.

For each of the major topics (sessions) a position paper will be written by the session conveners and made available before the workshop. It will contain the present status, the future requirements, and recommendations and schedules on how to realize the envisaged goals.

**EXPECTED RESULTS IN 2006**

Success of the Workshop on “Combination Research and Global Geophysical Fluids” 5-6 October 2006, Luxembourg.

**ACTUAL RESULTS FOR 2006**

Due to the major changes in the Centre's staff, the planned activities have not been implemented in 2006.



## **EDUCATION PROFESSIONNELLE / VOCATIONAL EDUCATION**

### **FORMATION EN MATIERE DE SECURITE ENVIRONNEMENTALE A L'INTENTION DES CADRES DES SERVICES REGIONAUX DES PAYS EURO-MEDITERRANEENS (Centre Euro-méditerranéen pour l'Evaluation et la Prévention des Risques Sysmiques, Rabat, Maroc)**

**PAYS CIBLES:** Pays du Maghreb

**COORDINATEUR LOCAL:** Rajae CHAFIL (Directeur de la Surveillance et de la Prévention des Risques)

**AUTRES PARTICIPANTS:** CEPRIS

#### **OBJECTIF DU PROJET**

##### ***Objectifs globaux :***

La réunion de Décembre 2004 sur la formation en sécurité industrielle, tenue avec les experts de l'Accord EUR-OPA au siège du Département de l'Environnement à Rabat, a mis l'accent sur l'importance des activités de formation en sciences du risque et notamment l'importance de la formation des inspecteurs en matière de sécurité environnementale, organisée en 2004 au Maroc.

Au cours de cette réunion, les discussions ont porté également sur les possibilités d'amélioration de cette formation au profit de cadres bénéficiaires en l'élargissant aux groupes régionaux et la spécialisation les candidats en vue de développer l'expertise marocaine en la matière avec le soutien de l'Accord EUR-OPA.

##### ***Objectifs spécifiques pour 2006:***

La formation assurée en 2004 sera étendue aux cadres des services régionaux : ils bénéficieront de la même formation sur les bases normatives et les connaissances scientifiques et techniques en la matière que les inspecteurs des services centraux auront reçu. Ceci permettra d'envisager en 2007 une formation complémentaire pour les inspecteurs centraux et régionaux avec des modules spécialisés (en fonction de leurs domaines de compétence respectifs) en matière de risques industriels, pollution atmosphérique, pollution chimique, pollution de l'eau et déchets industriels.

#### **RESULTATS ATTENDUS EN 2006**

Renforcer le réseau national d'inspecteurs en matière de sécurité environnementale et servir de projet pilote pour son éventuelle extension à d'autres pays membres de l'Accord.

#### **RESULTATS EFFECTIFS POUR 2006**

Des difficultés administratives lors du recrutement des formateurs ont empêché que cette activité ait lieu en 2006.

### **TRAINING PROGRAMME ON EARTHQUAKE ENGINEERING AND DISASTER MANAGEMENT (Natural Disasters Training Center of Turkey, Ankara)**

**TARGET COUNTRIES:** Turkey

**LOCAL COORDINATOR:** AFEM, Natural Disasters Training Center of Turkey

**OTHER PARTICIPANTS:**

#### **OBJECTIVE OF THE PROJECT**

##### ***Global objectives :***

To increase the awareness of private and public professionals involved in the building industry to good practices with respect to earthquake risk reduction.

##### ***Specific objectives for 2006 :***

AFEM plans to arrange in Ankara a training program on earthquake engineering and disaster management for civil engineers, geologists, architectures and provincial managers of the Ministry of Public Works and Settlement. For this purpose, academicians, experts and some non-governmental organizations have been invited to this program.

#### **EXPECTED RESULTS IN 2006**

120 participants in the Seminar “Presentation of Regulation On Buildings To Be Constructed In Disaster Areas;Evaluation And Strengthening of Existing Buildings” (AFEM Conference Hall-Ankara, May)

### **ACTUAL RESULTS FOR 2006**

The seminar was organized on May 11, 2006 by AFEM, which is established under General Directorate of Technical Research and Implementation of the Ministry. Mr. Atila ERENLER, president of Technical Department of “General Directorate of Constructive Affairs”, Mr. Cahit KOCAMAN, president of Earthquake Engineering Department of Department of Earthquake from “General Directorate of Disaster Affairs”, Mr. Fikret KURAN, Civil Engineer (MSc) from same department and Mr. Nejat BAYÜLKE, Civil Engineer (MSc) who is retired from Department of Earthquake were the lecturers of the seminar on “Regulation on Buildings Going to Built on Earthquake Areas” which was published on The Official Gazette (26100) on March 6, 2006 and will be validated after one year.

A total of 128 engineers from General Directorates of the 81 provinces were invited: two civil engineers from 45 provinces which have 1<sup>st</sup> degree earthquake risk and one civil engineer from remaining 36 provinces. Full participation was achieved and lecturers presented the new regulation and its associated new arrangements.

After the presentations, “questions and answers” part was organized in order to discuss the regulation, applications and problems facing in all provinces and the information was transferred between participants and lecturers within this “training of trainers” seminar which aimed presentation of the regulation to others and training of related people.

A “Regulation Book” which was specially printed for this seminar was distributed to participants and a poll was taken in order to give guidance to forthcoming training activities and also opinions of participants were asked. In this manner, guide information tried to be taken to observe the training progression and also to reach the object of the training. Especially discussions during “questions and answers” part indicated that, interest was at its maximum and aimed training was given during the seminar.

Subjects of presentations were:

#### **SECTION 1:**

- General introduction of studies on regulation (*Cahit KOCAMAN*)
- Changes made on existing parts:
  - Partial changes: calculations, principles, concrete (*Atila ERENLER*)
  - Principal changes: steel, mass (*Nejat BAYÜLKE*)

#### **SECTION 2:**

- Evaluation and strengthening of existing buildings:
  - General introduction - Getting information from buildings (*Fikret KURAN*)
  - Analysis with linear elastic method (*Fikret KURAN*)
  - Analysis with non-linear method (*Nejat BAYÜLKE*)
  - Strengthening methods (*Atila ERENLER*)

Mr. Ali Hürata, Asistant Director of Directorate of Technical Research and Implementation and Mr. Oktay Ergunay, retired director of Directorate of Disaster Affairs was attended to opening ceremony of the seminar which was successful and had full participation. Closing session started with closing speech of Mr. Necdet SEYFE, director of AFEM and tendering of “Document of Participation” to the participants.

All Seminar presentations will be disseminated from the AFEM website.

# **ALERTE PRECOCE – VULNERABILITE / EARLY WARNING - VULNERABILITY**

## **CREATION OF AN ACOUSTIC EARLY WARNING SYSTEM OF CATASTROPHIC DEBRIS FLOWS IN MOUNTAINOUS AREAS (*Geodynamical Hazards of High dams, Tbilisi*)**

**TARGET COUNTRIES:** France, Georgia, Armenia, Azerbaijan

**LOCAL COORDINATOR:** Prof. T. Cheldize (GHHD)

**OTHER PARTICIPANTS:** GHHD, ECTR, European Centre of Baku, CERG (Strasbourg)

### **OBJECTIVE OF THE PROJECT**

#### ***Global objectives:***

Catastrophic debris flows and mud-flows cause large human and economical losses in mountaneous areas. The examples are recent events in the Racha region (Georgia), Baku, Venezuela, etc.

The valley of the river Douroudji (Eastern Georgia) has been known for many years as a source of catastrophic debris flows that happen regularly every 15-20 years. They caused hundreds of victims in the town Kvareli.

Now the situation has become very dangerous as for the last 10 years nothing has been done about cleaning the river's bed nor the repair of defending construction.

The representatives of the EUR-OPA Major Hazards Agreement experts (Mr. Massue, Dr. Maquaire) visited on mission the Douroudji valley and compiled the report where the situation in the valley is assessed as critical.

We suggest to create a cost-effective early warning system, based on acoustic emission sensors in order to inform the extremal situation unit in Kvareli on the start of debris flow.

The suggested technique could be used in all countries of Southern Caucasus as they also have similar problems.

#### ***Specific objectives for 2006:***

To create a cost-effective early warning system, based on acoustic emission sensors in order to register the start of landslides/debris flows.

### **EXPECTED RESULTS IN 2006**

Creation of the functioning model of a cost-effective early warning system (EWS), based on acoustic emission sensors in order to register the start of landslides/debris flows.

Kick-off meeting of participants in Tbilisi (March 2006).

Preparation of functioning model of EWS (November 2006.)

Field testing of EWS (December 2006).

### **ACTUAL RESULTS FOR 2006**

#### ***Introduction***

Each year debris-flows (mud-flows, earth-flows) cause a lot of disasters in mountainous areas all over the world (see special issue of *Journal of Physics and Chemistry of Earth*, vol.25, No.9, pp. 705-797, 2000). Periodically thousands of populated areas, roads, oil and natural gas pipeline routes, high voltage electric lines and agricultural lands are under the heavy influence, sometimes with catastrophic impact of hazardous geological processes. Catastrophic mass-movements not only periodically strongly damage the environment but they also are followed by human losses. Thus it is of great importance to create reliable and cost-effective early warning systems for monitoring mass-movements in potentially dangerous areas.

The territory of Caucasus due to the development of large-scale hazardous geological processes, their frequent reoccurrence, growth of population and land use as well as of large engineering constructions belongs to the hardest hit mountainous regions in the world. The annual economical losses due to geomorphological hazards in Georgia are of order of 100 mln. USD.

Basin of Duruji river in Eastern Georgia is the classical example, illustrating the intensity and power of debris flows and their catastrophic consequences, directly threatening the town of Kvareli located on the eastern part of the accumulation zone of the mass flow as well as the objects of agricultural designation. In the last 115 years there were 31 cases of large debris-flows; the associated human losses reach 200 mln USD. The preventive early warning, due to difficulties in economy, was practically abandoned. Thus creation of effective early warning/ monitoring system for the region is of vital importance.

#### ***Equipment***

There are a lot of methods in monitoring mass-movements: geodesy, extensometry, Global Positioning Systems, laser and radar interferometry, etc. The accuracy of most precise techniques approaches 0.1 mm. The cost of such systems is high enough. Besides direct measurements of displacements, it is possible to register the accompanying effects, for example, acoustic emission, generated by the mass-movement; these methods are less expensive. Recently several such systems for registration of dynamical geomorphological processes have been developed, namely, seismometers, piezoelectric or magnetoelectric sensors and acoustic microphone sensors. The best signal (S) to noise (D) ratio (S/D) was obtained for acoustic sensors.

It is established that the debris-flows generate soil vibration in the low-frequency range (0-100 Hz) and that the maximum in the power spectrum is obtained in the vicinity of 40 Hz.

Taking into account the results of field observations of acoustic emission (AE) during catastrophic debris-flows, Institute of Geophysics and European Centre of Geodynamical Hazards of High Dams carried out analysis of existing systems and the debris-generated AE monitoring equipment, consisting of acoustic sensors, special filters and low-noise amplifiers (LNA) and a notebook, has been assembled.

The main requirements to the system were: minimal energy consumption, autonomous functioning, maximal linearity of amplitude-frequency characteristics (AFC) of sensors and amplifiers in the used frequency range, maximal signal to noise ratio. To fulfill these requirements the capacity microphones were used as sensors, due to the linearity of their AFC in the range 10-1000 Hz. Microphone heads were installed directly on the card of the primary low-noise amplifier in the waterproof casing of the sensor (metal casing of a length 60-70 cm and external diameter 3.5-4 cm). The power (stabilized voltage 9 V) is supplied to LNA through waterproof connector by the signal coaxial cable. The current consumption by two sensors does not exceed 10 mA). Location of LNA in the close vicinity to sensors allows using long signal cables without risk of spoiling signal to noise ratio; in turn this makes it possible to place sensors relatively far from each other (at the distance 150-200 m). Two-sensor system of registration is much more reliable for recognition of mass-movement initiation.

Filters are necessary for debris-induced signal bandwidth assignment and reduction of possible noise from the long signal cable. After processing of the signal by input LNA and filters the signal is amplified by scale amplifier in order to match the system output to the recorder characteristics.

The whole system is powered by 12 V battery and consumes no more than 40-45 mA.

#### **Field test**

During field tests the microphone sensors were installed inclined in pits at the depth of 0.7 m; they were separated by the distance of 5 m. Acoustic signal was initiated by dropping of the weight (mass 7 kg) from the 1.2 m high approximately in the middle point between sensors. During the experiment microphone sensors were installed in two pits at the depth of 0.7 m. The distance between sensors was 1 or 5 m. The acoustic signal was generated by dropping the weight (with a mass 7 kg) from the 1.2 high at various separations from the sensors along the normal to the line, connecting sensors. The normal was located approximately at the middle point between sensors. The records of the sensors and the moments of acoustic signal initiation correspond to following separations of the source and sensors

- 1) record take 001 – 2,5 m
- 2) record take 002 – 0,5 m
- 3) record take 003 – 4 m
- 4) record take 004 – 9 m

Registration and processing of the acoustic signal was realized on the sound card of notebook using the program Sound Forge. Acoustic signal's amplitude substantially decreases with a distance and the decrease follows exponential law. It seems that the sensitivity of the system suffice to register the initial stage of catastrophic debris flow. The analysis of frequency content of the recorded signals shows that the maximal emission in the field tests corresponds to 70 Hz.

#### **Developing EWS Communication System**

During development of EWS system for Dourouji valley we used the experience obtained by the Ministry of Internal affairs, which for several seasons organized temporary observations at the source of debris flow. The special team was placed at the source and the communication with rescuer centre at the city of Kvareli was realized by radiotelephone.

These observations prove that the frequency...157-170 MHz was good for communication between observation site and rescuer centre for special case of Dourouji valley orography. This frequency was approved as satisfactory for developing EWS system in the area.

The EWS Communication System should answer to following requests, taking into account the inaccessibility of observation site for regular visits:

- i. possibility of operative change of device parameters and warning tasks
- ii. necessity of permanent observation of natural process
- iii. autonomy of data transfer system and minimization of power consumption
- iv. high requirements to protection of sensors and transfer system from bad weather conditions

Accordingly, the flow block of the system looks like following:

- i. *active shift sensors with phantom power supply (AD)*

For high reliability of system two active shift sensors are used. They are manufactured as water-proof devices.

ii. *signal adder (Σ), phantom power supply scheme (E+), codec modulator (C/M)*

Signal adder (Σ) adds signals from two active sensors which are placed at different locations. The phantom power supply scheme (E+), provides the supply of power to sensors by the same coaxial cables, which connects signal adder with two sensors. The frequency range of wanted signal is 1-300 Hz. Translation of such LF signal by radiofrequency needs large energy consumption. Besides, it is hard to put this information into radio devices. It seems optimal to shift the spectra of data into standard modulation range of radio(-)telephony, namely, 350-3.5 Hz. Obtained narrow-range radio signal satisfies all conditions and norms of radio transfer of data and is also low consuming solution (narrower the range, less energy is consumed at the same transfer distance). The range shift is provided by codec-modulator; the demodulated signal can be recorded directly on the standard PC sound card.

iii. *synthesiser-modulator of radio channel (SYN), HF power amplifier (PA HF) and filter (F HF) and antenna-feeder device (ANT)*

Digital synthesiser of frequency provides forming of frequency of radiochannel for data transmission and frequency modulation by codec signal. From the output of synthesiser-modulator the signal is sent to economic power amplifier of class "C" to minimize the power consumption. The amplified signal passes HF filter at the output of power amplifier and enters the antenna-feeder device (ANT). Fider is of minimal length in order to decrease HF power losses. Antenna is chosen of limited amplification as the large number of directed elements increase the area of antenna, which may worsen its resistance to strong wind.

iv. *system of self-contained power supply*

Data transfer system gets power from the battery 12V/50 AH. For charging of battery in the day time will be used solar panels of calculated power no less than 80 W. The large power of solar batteries is needed for normal functioning of the whole system in the night time. For optimization of the battery charging the solar panels are connected to the system by DC/DC converter, which controls the charging current and voltage. This allows optimization of solar panels power consumption. In the power system the battery protection scheme is foreseen; it switches off the appliance load when the battery voltage drops lower than 9.5 V. The scheme restores the power supply automatically when the voltage rises up to 12.6 V.

## **GIS-MAPPING OF INTEGRATED MAJOR HAZARDS IN THE SOUTHERN CAUCASUS AS THE EARLY WARNING TOOL (Geodynamical Hazards of High dams, Tbilisi)**

**TARGET COUNTRIES:** Armenia, Azerbaijan, Georgia

**LOCAL COORDINATOR:** Prof. T. Chelidze (GHHD)

**OTHER PARTICIPANTS:**

**SPECIALIZED CENTRES:** ECTR (Armenia), European Centre of Baku, CESG (Strasbourg)

**COUNTRIES AUTHORITIES:** Ministry of Environment Protection of Georgia

### **OBJECTIVE OF THE PROJECT**

#### ***Global objectives :***

The sustainable development of the Southern Caucasus (SC) region depends critically on the correct assessment of natural hazards that are characteristic for different areas of this mountaneous region: earthquakes (EQ), floods, landslides, avalanches, debris flows.

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. The planning of these objects, their exploitation and insurance demands exact cartography of dangers that can affect these constructions as well as the population of the region.

The GIS-technology + space images allow exact mapping of such dangers and assessing integrated effects. For example, EQ are inducing many secondary effects that may cause even larger damage than the event itself. Combining maps of seismic hazard with maps of landslide-prone areas and lakes gives chances to evaluate integrated hazard and risk.

GHHD has high level specialists of GIS-technology and can support the regional SC program of creating integrated natural hazards map of the region of the scale 1: 1 000 000.

#### ***Specific objectives for 2006 :***

Compilation of space images and elevation maps of Caucasian Republics of the scale 1: 1 000 000.

Creation of data bases on seismic and geomorphological hazards of Caucasian Republics.

### **EXPECTED RESULTS IN 2006**

Kick-off meeting of participants in Tbilisi (20 April 2006).

Compilation of basic maps and data bases.

### **ACTUAL RESULTS FOR 2006**

More than 20 scientists and decision makers from Armenia, Azerbaijan and Georgia participated in the II International Workshop “GIS-based Mapping of Integrated Hazards in the Southern Caucasus as the early warning tool” (Tbilisi, 27-28 November 2006), organized by EUR-OPA Major Disasters Agreement and M.Nodia (Institute of Geophysics), with 12 national and several thematic reports presented.

*Acknowledging* the bygone, long-standing and ongoing contributions of the Open Partial Agreement on Major Hazards at the Council of Europe, the Global Seismic Hazard Assessment Program (GSHAP), the INTAS Programs of the European Commission, the ISTC programs, the U.S. CRDF Programs and the NATO Science for Peace Programs which provide funding for disaster prevention activity in Southern Caucasus as well as contributions by the Azerbaijan, Georgian, Armenian Academies of Sciences, respectively but also by the authors of Global Natural Disaster Hotspots Map, the authors of World Map of Natural Disasters of Munich Group, the International Geoscience Programme (IGCP) and the International Hydrological Program (IHP) of UNESCO;

*Recalling* the relevant recommendations of the World Conference on Disaster Reduction (WCDR), held in Kobe, Japan, January, 2005 and the Third International Conference on Early Warning (EWCIII), held in Bonn, Germany, 27 – 29 March 2006;

*Noting* the valuable contributions and intensive discussion during the Workshop;

*Recognizing* that

- (1) the Region is prone to many natural and man-made hazards
- (2) the Region is a gateway which connects Europe and Asia and therefore, the safety and security of the Region is of crucial importance;
- (3) the Region plays a key role in the energy supply for many countries, and natural disasters are pending dangers for vulnerable lifelines and constructions such as water supply and reservoirs, pipelines, and power plants;
- (4) An extreme natural event can trigger major social disorder or even conflicts in the Caucasian republics that may have an impact of global significances;

*Emphasizing* that

- (1) The economic impacts of natural disasters usually, by orders of magnitude, exceed the cost of mitigation;
- (2) Existing technology for satellite observations (e.g., GPS and InSAR), real-time geophysical and environmental monitoring, and natural hazard prediction models (e.g., earthquake, mud volcano, landslide, flood and tsunami warning models and quantitative predictions of extreme events) could prevent loss of life in the Region due to the natural disastrous events if their predictions were timely prepared and delivered and warnings were heeded by the disaster management authorities;
- (3) Improved management of disaster relief efforts, adequate scientific knowledge, existing technology, and data could provide Regional Rescue Agencies and national civil defence managers and other decision makers the immediate quantitative estimates of the occurrence, extent and severity of the disaster;

*Conclude and recommend that:*

- Natural hazards on the territory of Southern Caucasus caused in the last decades a total hazard of the order of dozens of billions USD; the largest damage is associated with earthquakes. Considerable damage is connected with catastrophic mass-movements (landslides, debris-flows), flashfloods, floods, avalanches and hail. New social and economical realities and climate change lead to increase of negative impact of natural disasters on the stable development of the countries of South Caucasus.
- 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. For the most part of disasters (earthquakes, landslides, volcano eruptions, debris flows, etc) that information is partially or totally absent or the alarm time is too short for practical purposes. That is why the concept of early warning should be broadened to include the probabilistic assessment of hazard and its recurrence period. In other words, we need both stationary and time-dependent spatial mapping of hazards using GIS-technology. This approach allows carrying out a lot of preventive activities (say, land use planning), which can reduce considerably the losses and casualties from catastrophes. To develop that approach it is necessary to have realistic models as well as the statistical information on disasters (national inventories) for their verification. At present as a rule the nations of Caucasus region do not have a systematic GIS-based inventory of all hazard events and their associated losses (property, crops or human casualties) in one centralized location.
- The participants of workshop in the framework of specific concerted programme: *GIS Mapping of Integrated Major Hazards in the Southern Caucasus as the early warning tool* compiled and approved the multi hazard maps of South Caucasus countries (seismic, landslides, debris flows, avalanches, flash-floods and floods) on the scale 1 :1 000 000 using GIS-technologies as well as corresponding data bases. These results give a strong basis for developing in future the well-grounded regional risk assessments for mortality and economic losses and designing risk reduction strategy.

- It should be stressed that there are big discrepancies in hazard and risk assessments, in particular, for Caucasus region in different World Disaster Maps (compare, for example Global Natural Disaster Hotspots Map with the Map of Global Seismic Hazard Assessment Program GSHAP and World Map of Natural Disasters of Munich Group). The same situation is in global loss diagrams from various sources: the percent of earthquake losses varies from 8% in WMO assessments to 50% in UN publications (Living with Risk, 2002). Earthquake risks are even larger for countries of South Caucasus, which contradicts to Hotspot Map assessments, which states that this region is prone only to hydrological risks. These discrepancies may cause serious difficulties for investors and insurance companies. We conclude that it is of major importance to refine hazard and risk assessments for South Caucasus using detail local data.
- Participants of the workshop point to difficult economical situation, which makes the South Caucasus extremely vulnerable to disaster impact. In fact the grave consequences of Spitak and Racha devastating earthquakes even now, almost twenty years after events are not eliminated. Besides, it is important to correct the mentioned discrepancies in assessment of hazard and risk for South Caucasus. Hence, participants apply to the Direction of ISDR as well as to other international institutes to support regional disaster reduction programs, which could ensure the safety of population and resilience of economic infrastructure of the region to disaster impact.
- Developing a standardized accounting of hazard events and losses for the nation and a region using GIS is of crucial importance for development of early warning system in the broad sense of the word. The accumulation of statistical data allow developing of well-founded probabilistic (time-independent) natural hazards assessment techniques similar to well known seismic hazard and risk assessment method. The procedure should foresee the same 4 steps (source, intensity-recurrence relation, spatial attenuation and effect at the site) for other hazards and additional steps for risk (exposure, vulnerability, losses) as in well-standardized seismological approach.
- 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. Such agencies should be active not only after disaster, but permanently for carrying out the strategy of preparedness to (prevention of) impending hazards. The agencies could suggest the new legislation acts to their government that will regulate safe land use schemes, modern building codes and correct insurance strategy.
- As the first steps to improving the resilience of countries of Caucasus region to disasters workshop recommends coordinating more closely the activity of in following directions, including organization of relevant international working groups:
  - i. *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.*
  - ii. *Compilation of coordinated GIS-base natural hazards catalogue of South Caucasus region.*
  - iii. *Publication of the Atlas of Natural Disasters of Southern Caucasus.*
  - iv. *Preparation of regional programs of hazard and risk assessment and reduction for submission to ISDR, World Bank, International Bank for Reconstruction and Development and other International institutions.*

## **FRAGILITY OF EXISTING BUILDING STOCKS IN CASE OF EARTHQUAKES** **(European Centre on Urban Risks , Lisbon)**

**TARGET COUNTRIES :** Italy, France, Macedonia

**LOCAL COORDINATOR:** L. A. Mendes-Victor

**OTHER PARTICIPANTS :** CUEBC, ECILS; Society of Engineering Seismology, Emergency, Geophysical Centres

### **OBJECTIVE OF THE PROJECT**

#### ***Global objectives :***

General methodology to evaluate the evolution of aggregates behaviors under large seismic events.

#### ***Specific objectives for 2006 :***

Training course for 20 post graduate attendants.

### **EXPECTED RESULTS IN 2006**

The concept of fragility will be developed in order to allow the assessment of seismic risk of Historical Centers.

Visits to Urban Historical Centres in Portugal (4 days in September).

### **ACTUAL RESULTS FOR 2006**

The planned activities have not been implemented in 2006.

**CREATION OF REGIONAL CAPACITY AND TASK FORCE FOR POST-DISASTER DAMAGE ASSESSMENT (European Center on Vulnerability of Industrial and Lifeline Systems, Skopje)**

**TARGET COUNTRIES:** All EUR-OPA MHA Countries

**LOCAL COORDINATOR:** Prof. Dr. Zoran MILUTINOVIC, Director ECILS-Skopje

**OTHER PARTICIPANTS:**

**SPECIALIZED CENTRES:** AECRIS - European Centre for Rehabilitation of Buildings (Bucharest, Romania); AFEM - European Natural Disasters Training Centre (Ankara, Turkey); ECTR - European Interregional Educational Centre for Training Rescuers (Yerevan, Armenia); CEPRIS - Euro-Mediterranean Centre for Evaluation and Prevention of Seismic Risk (Rabat, Morocco); ECPFE - European Centre on Prevention and Forecasting of Earthquakes (Athens, Greece)

**COUNTRIES AUTHORITIES:** National authorities responsible for operative management of post-disaster effects and relief operations of DPPI Countries'.

**OBJECTIVE OF THE PROJECT**

***Global objectives:***

Experience all over the world shows again and again that countries affected by destructive events find it hard to produce damage assessments that satisfy national needs as well as requirements of international agencies and donors. This task is often finally entrusted to external experts, which can lead to unnecessary evacuation of buildings, prolonged accommodation of inhabitants in unsafe structurally damaged buildings, delays of the recovery process, etc.; the costs of which are borne by disaster victims, communities and their governments.

The project intends to create a suitable technically consistent and consensused methodology and format for damage assessments in the EUR-OPA MHA region that could be discussed and agreed upon with major donors (including the EC, Council of Europe Development Bank, European Bank for Reconstruction and Development etc.) followed by the training of specialists and forming of a regional damage assessment task force to be rapidly deployed in major disasters (earthquakes, floods and high winds) within the EUR-OPA MHA region but eventually even wider.

***Specific objectives for 2006:***

Development of a suitable technically consistent and consensused methodology and format for damage assessments in the EUR-OPA MHA region for the following hazards: earthquake, flood and high winds.

**EXPECTED RESULTS IN 2006**

Technically consistent and consensused methodology and format for damage assessments that satisfy national needs of EUR-OPA MHA countries and requirements of international agencies and donors.

● Kick-off meeting (May)

Review of damage assessment procedures and formats used in EUR-OPA MHA countries and worldwide, definition of common principles, tasks, obligations and road-map.

● Development of the damage assessment methodology, procedure and format (June-December)

Development of the methodology, procedure and format for damage assessments considering the following hazards: earthquakes, floods and high winds.

● Workshop (December)

Final presentation and review of achievements, professional consensus, discussion and agreement with country authorities, international agencies and donors.

**ACTUAL RESULTS FOR 2006**

The Kick-off Meeting on "Creation of Regional Capacity and Task Force for Post-Disaster Damage Assessment" organized by ECILS-Skopje was held in the premises of the Institute of Earthquake Engineering and Engineering Seismology, University "Ss. Cyril and Methodius", Skopje, on 14 and 15 December, 2006.

On the basis of contributions presented by delegations of, by alphabetic order, Armenia, Greece, TFYR of Macedonia, Morocco, Romania, Turkey, as well as the related discussions, the Delegates adopted the following conclusions.

**1. Opening of the Kick-off Meeting and adoption of the agenda**

Prof. Mihail Garevski, Director of the Institute of Earthquake Engineering and Engineering Seismology, IZIIS-Skopje, opened the Kick-Off Meeting by welcoming the delegates and presented the organization and activities of IZIIS-Skopje Institute.



Prof. Zoran Milutinovic, Director of European Center on Vulnerability of Industrial and Lifeline Systems (ECILS-Skopje) introduced the objectives and the scope of the initiative "Creation of Regional Capacity and Task Force for Post-Disaster Damage Assessment", introduced the agenda and proposed the organization of the Kick-off Meeting, and provided guidance on the way contributions be presented and discussions be made.

During the course of the presentation, it was clearly elaborated that, besides the general strategic objective of the Coordinated Programme depicted by its title: "Creation of Regional Capacity and Task Force for Post-Disaster Damage Assessment", its specific objectives are:

- thematically in a perfect conformity with the Medium Term Plan 2002-2006 [AP/CAT (02) 38 rev.3], sections B.1 and B.2, item III and in the spirit of already consensused need for enhancement of regional cooperation,
- development of suitable, technically consistent and consensused, methodology and format for damage and loss assessments in the EUR-OPA MHA region that should be discussed and agreed upon with major donors (EC, Council of Europe Bank for Development, European Bank for Reconstruction and Development etc.);
- provision of the consensused common and standardized base for training of [national] specialists; and that,
- in cooperation with other initiatives in the region, intends to form a regional damage assessment task force for rapid deployment in major disasters (earthquakes, floods and high winds) within the EUR-OPA MHA region and/or eventually even wider;

and that the first Phase of the Programme, being the major focus of EUR-OPA MHA in 2006, supposes to:

- summarize and harmonize the existing national and regional [Earthquake, Flood and High Wind] post-disaster Damage&Loss assessment methodologies; and,
- on that base to develop and propose the Unified EUR-OPA MHA Methodology for Earthquake, Flood and High Wind Damage assessments in EUR-OPA MHA region.

To achieve the stated goals the following Kick-off meeting Working plan has been proposed:

- Present the Damage & Loss assessment procedures used in countries from Balkan, Caucasus and Maghreb regions;
- Exchange national/regional experiences;
- Identify and summarize common aspects and the existing gaps;
- Identify and decide on other necessary details;
- Decide on the follow-up and define the road map for further project development; and
- Articulate the decisions and conclusions to be presented on the pending PC meeting (June 26-27, 2006).

The agenda and work plan were unanimously adopted.

## **2. Information from delegations**

Each delegation contributed by presenting the national procedures and background criteria for physical damage assessment implemented in recent earthquake disasters. In total 6 national contributions have been presented by:

Dr. Alvaro ANTONYAN representative delegated by ECTR - European Interregional Educational Centre for Training Rescuers (Yerevan, ARMENIA)

Dr. Marina MORETTI representative delegated by ECPFE - European Centre on Prevention and Forecasting of Earthquakes (Athens, GREECE)

Dr. Azelarab EL MOURAOUAH representative delegated by CEPRIS - Euro-Mediterranean Centre for Evaluation and Prevention of Seismic Risk (Rabat, MOROCCO)

Mrs. Neslihan YIKILMAZ representative delegated by AFEM - European Natural Disasters Training Centre (Ankara, TURKEY)

Mr. Constantin PRAUN representative delegated by AECRIS - European Centre for Rehabilitation of Buildings (Bucharest, ROMANIA)

Dr. Zoran MILUTINOVIC representative delegated by ECILS- European Centre on Vulnerability of Industrial and Lifeline Systems (Skopje, TFYR of MACEDONIA)

## **3. Conclusions**

Following the extensive discussion on the presented Damage and Loss assessment aspects, the participants agreed on the following:

- the built environment of EUR-OPA MHA region, with some specificities related to traditional construction, is generally similar and consists of: (1) traditional stone, sun-backed and fired brick masonry and non-engineered concrete and reinforced concrete (RC) family dwelling housing in rural, and (2) dominantly concrete and better engineered, even seismic resistant) RC dwelling housing, buildings and building complexes in semi urban and urban areas;
- similarity of built environment over the EUR-OPA MHA region allows development of an uniform methodology and format for Damage and Loss assessment that will satisfy national needs of EUR-OPA MHA countries and meet requirements of international agencies and donors;

- the presented procedures for damage assessment are following the principle directions and format set by UNDP/UNIDO-RER/79/015 project "Building Construction Under Seismic Conditions in the Balkan Region", Vol 4 (1985): "Post-Earthquake Damage Evaluation and Strength Assessment" supported by the governments of Bulgaria, Greece, Hungary, Romania, Turkey and [former] Yugoslavia, which again is a sound base for meeting the general and specific objectives of the Programme "Creation of Regional Capacity and Task Force for Post-Disaster Damage Assessment",
- Damage and Loss assessment procedures and formats, beside primary identified hazards: earthquake, flooding and high winds should be extended to landsliding as a hazard collateral to earthquakes and flooding;
- Greece, in cooperation with European Commission, Directorate General Environment, Unit D3: Civil Protection has developed a computer system PEADAB (Post Earthquake Emergency Assessment of Building Safety) to support the setting up and carrying out efficiently an operation of post-earthquake emergency building inspections in populated areas stricken by damaging earthquakes;
- PEADAB is the most advanced and ready-for-use IT tool for such needs in EUR-OPA MHA region and as such might be used as skeleton for development of an uniform methodology, format and adequate IT tool for Damage and Loss assessment that will satisfy national needs of EUR-OPA MHA countries and meet requirements of international agencies and donors;
- Development of an uniform Damage and Loss assessment procedure and format, and desirably of an adequate and integrated IT tool for decided hazards will meet the following strategic long term EUR-OPA MHA objectives and policies:
  - To support and supplement efforts at national, regional and local levels to prevent disasters and, if they happen, to help those responsible for emergency/disaster management and response to be better prepared,
  - To establish a framework for effective and rapid cooperation between national emergency/disaster management and response services when mutual assistance is needed,
  - to enhance the coherence of actions undertaken at international, national, regional and local level in the field of emergency/disaster management and response,
- All EUR-OPA MHA Countries and specialized Centres are invited to participate in the future activities of this initiative, however Centres being represented at Skopje Kick-off meeting, as a core, should undertake coordinating and catalyzing role in Balkan, Caucasus and Maghreb regions;
- EUR-OPA MHA Secretariat shall explore the possibility that the PEADAB IT tool, with adequate training, is put on disposal to interested in EUR-OPA MHA Countries and implemented by their specialized European and Euro-Mediterranean Centers
- National reports on the presented Damage and Loss assessment procedures and formats, including the legal aspects and current/potential status of their national implementation, shall be prepared, summarized and presented in an synthesized form within the period of 4 months under (I propose ECILS, please comment) coordination;
- Centres presented on Skopje Kick-off Meeting posses an adequate scientific and technical capability to create a consortium that, under the lead of Greece, can launch an attractive, EUR-OPA MHA wide, project in the stated topic for external financing.
- Permanent Correspondent of TFYR of Macedonia should inform Permanent correspondents of Countries involved to undertake national and international coordination on the initiative, as well as assure favourable conditions for organizing the next meeting.

Participants are expressing their deep gratitude to Prof. D. Jurukovski, Permanent Correspondent of TFYR of Macedonia, Prof. Zoran Milutinovic, Director of Skopje EUR-OPA MHA Center and Prof. M. Garevski, Director of IZIIS-Skopje for creating the favourable conditions and organization of Kick-off Meeting on "Creation of Regional Capacity and Task Force for Post-Disaster Damage Assessment".

**OPERATIVE DUTY ON ESTIMATION OF POSSIBLE CONSEQUENCES OF EARTHQUAKES, IN FRAMES OF WORKING WITH GIS "EXTREMUM" (European Centre of New Technologies for the Management of Natural and Technological Major Hazards, Russian Federation)**

**TARGET COUNTRIES :** EU and countries in zones of seismic activity

**LOCAL COORDINATOR:** Kudrin A.U.

**OTHER PARTICIPANTS :**

**OBJECTIVE OF THE PROJECT**

***Global objectives:***

Risk decreasing and mitigation of earthquake consequences.

***Specific objectives for 2006:***

Improving of scenario reaction for seismic event and specification of human losses estimation in real time (on-line)

### **EXPECTED RESULTS IN 2006**

Increasing a number of saved people because of time reduction for reaction on seismic event

### **ACTUAL RESULTS FOR 2006**

According to the geophysical service of Russian Academy of Sciences 3419 seismic activities were registered in the world during 2006: every day from 5 up to 20 earthquakes are registered.

The most seismically active zones in the Russian Federation are the Far East region and the republics of Northern Caucasus. It should be also mentioned that in Western region (Kaliningrad) and Siberia seismic activity is according to background or slightly exceeds it. Seismically active zones of the Far East are: Kamchatka, Kuriles and Koryak Autonomous Region, where seismic activities more than 5.5 points are registered. According to the quantity of strong earthquakes, the most seismically dangerous region are Kuriles, then comes Koryak Autonomous Region and Kamchatka.

On other part of the world seismically active zones are south-eastern Asia (Indonesia, New Guinea, Philippines, Mariana islands, Andaman islands), Australia and Ocenia (islands Vanuatus, Fidji, Tongo, Kermadeck), South America (Argentina, Peru, Chile, Ecuador, Panama), Far East region (Japan), the Asian region (China, Nepal, India, Mongolia), the Near East (Iran, Afghanistan), Africa (Mozambique, island Madagascar), Northern America (Alaska), and the European region (Turkey, Greece, Italy).

Data about the registered seismic events is presented in the table №1 of the full report.

By quantity of strong earthquakes in the world those regions are Indonesia (island Java, island Sumatra, islands Andamanske), Ocenia (islands Vanuatus, Tonga, Kermadeck, Fidji), Africa (Mozambique), South America (Chile, Panama, Peru), Asia (Nepal, India, China, Mongolia), the Near East (Iran), the Europe (Greece), Northern America (Alaska). By quantity of strong earthquakes Indonesia and Ocenia is in the lead. Data about the strong seismic events (>5.5 points) is presented in table №2 of the full report.

Destructive seismic event as a result of which 37 people in territory of the Russian Federation has suffered was the earthquake in Koryak Autonomous Region, which was registered on 20.04.2006. 60 % of buildings and constructions received destructions. In the countries of the world destructive earthquakes were registered in Mozambique (Africa) by which victims were 15 people, including 2 people dead. On island Java (Indonesia) because of catastrophic earthquake suffered more than 5000 people, in that including more than 2000 people dead.

As a result of the analysis of seismic activity during the period from 01.01.2006 to 10.11.2006 we may conclude that on the territory of the Russian Federation the most seismically dangerous zones are Koryak Autonomous Region, Kuriles, Kamchatka which means that it is all Far East region. On the other part of the world they are Indonesia, Oceania, South America, and South-Eastern part of African continent.

# LEGISLATION – GESTION / LEGISLATION - MANAGEMENT

## ANALYSE DU RÔLE DES AUTORITÉS LOCALES ET RÉGIONALES DANS LA RÉDUCTION DES RISQUES DE CATASTROPHES (Institut Supérieur de Planification d'Urgence, Belgique)

**PAYS CIBLES :** Tous les pays de l'Accord

**COORDINATEUR LOCAL:** Monique BERNAERTS et Alexandra SONCK

**AUTRES PARTICIPANTS:** Correspondants locaux, CEPRIS (Centre marocain)

### OBJECTIF DU PROJET

#### **Objectifs globaux:**

Analyse comparée du rôle des autorités locales et régionales dans la réduction des risques de catastrophes

#### **Objectifs spécifiques pour 2006 :**

Analyse des solutions en place dans les pays membres .

### RESULTATS ATTENDUS EN 2006

- Rédaction d'un document de synthèse
- Création d'un Cercle de travail sur le sujet
- Définition des objectifs avec les partenaires

### RESULTATS EFFECTIFS POUR 2006

Il ressort de la dernière réunion des Directeurs de Centres des 2 et 3 février 2006 et de celle du Bureau du 10 mars 2006, que le rôle des autorités locales dans la réduction des risques de catastrophe serait un des thèmes phare des activités 2006 (mais également dans le Plan à moyen terme 2007-2011) de l'Accord EUR-OPA et de la 11<sup>ème</sup> session interministérielle prévue à Marrakech le 31 octobre 2006. Ce thème a donc été retenu comme prochain sujet d'analyse.

A la différence des autorités nationales, les autorités locales et régionales sont concernées par tous les aspects de la gestion des risques en raison de leur meilleure connaissance de l'histoire et de la géographie du terrain. Leur rôle dans la gestion des risques est en outre essentiel de par leur position de première ligne en cas de catastrophe et de leur proximité avec les citoyens. Le retour d'expérience de la catastrophe de Ghislenghien en Belgique (explosion d'une canalisation de gaz sous haute pression le 30 juillet 2004) a montré que les autorités locales constituaient la charnière essentielle en matière d'information du fait qu'elles sont chargées tant de la délivrance des permis de bâtir (identification du risque<sup>1</sup> et prévention), que de la rédaction de plans d'urgence (préparation) et des premiers secours (gestion). Elles sont en outre impliquées dans le retour à la vie normale tant pour les victimes que pour le site touché (rétablissement).

Le projet d'analyse comparative du rôle des autorités locales et régionales comportera plusieurs étapes. La première décrira de manière générale le rôle des autorités locales et régionales dans chaque phase de la gestion des risques majeurs. Les étapes suivantes viseront à compléter ce canevas par une description, par pays, du rôle reconnu aux autorités locales et régionales dans la gestion des risques majeurs. Il est donc d'ores et déjà fait appel aux autres membres de l'Accord à manifester leur intérêt à participer à cette analyse.

Pour 2006, le Conseil de l'Europe et l'Institut Supérieur de Planification d'Urgence (ISPU) ont convenu de la rédaction d'une analyse préliminaire sur le « Rôle des autorités locales et régionales dans la réduction des risques de catastrophe ». L'analyse dont il est question a été réalisée à partir: des précédentes études<sup>2</sup> de l'ISPU, du Cadre d'actions de Hyogo pour 2005-2015 adopté lors de la Conférence des Nations Unies pour la prévention des catastrophes naturelles<sup>3</sup>, des travaux déjà réalisés sur le sujet par le Congrès des Pouvoirs

<sup>1</sup> En ce compris la cartographie

<sup>2</sup> K. VAN HEUVERSWYN., *Structures nationales de protections civiles*, Strasbourg, ISPU, 1998

K. VAN HEUVERSWYN., *Etude comparative des législations en matière de gestion des risques*

*majeurs dans les 26 pays membres de l'Accord du Conseil de l'Europe EUR-OPA Risques*, Strasbourg, ISPU, 2003 (AP/CAT(2003)39).

K. VAN HEUVERSWYN., *Analyse comparative de la gestion interministérielle des risques majeurs : Belgique, France, Russie, Bulgarie*, Strasbourg, ISPU, 2005. (AP/CAT(2005)30)

<sup>3</sup> Cadre d'action de Hyogo 2005-2015 : « Pour des nations et des collectivités résilientes face aux catastrophes », Kobe, Japon, 2005. [http://www.un.org/french/ha/natural\\_disaster/index.asp](http://www.un.org/french/ha/natural_disaster/index.asp)

Locaux et Régionaux du Conseil de l'Europe (CPLRE), de la recommandation sur le « Rôle des collectivités locales et régionales dans la prévention des catastrophes et la gestion des situations d'urgence » adoptée lors de la 11ème Session ministérielle de l' Accord<sup>4</sup> ainsi que des exposés et interventions menés a cette même occasion.

Sa méthodologie s'inspire de la table ronde tenue lors du séminaire organisé par l'ISPU le 28 juin à Paris, sur le thème de la gestion interministérielle des risques majeurs. Celle-ci relevait que les bonnes pratiques ne peuvent être considérées comme des modèles directement transposables, chaque crise et chaque zone sinistrée présentant ses propres spécificités, avec pour conséquence que les solutions retenues à tel endroit peuvent se révéler inadaptées ailleurs. Le sentiment général était qu'il devrait néanmoins être possible de préciser des modèles communs, en réalisant une description fonctionnelle de chaque phase de la gestion du risque. La première partie brosse donc le rôle essentiel des autorités locales et régionales à travers chaque phase de la gestion des risques majeurs. La deuxième partie replace ce rôle dans le cadre d'une stratégie globale de gestion des risques, à la recherche de pistes de réflexion sur les actions à envisager pour impliquer davantage les autorités territoriales dans la gestion des risques majeurs.

Des contacts ont été pris et des réunions internes et externes ont été organisées. Suite aux recherches menées et à l'étude du matériel précédemment collecté, un document de synthèse a été rédigé : un rapport d'environ 30 pages décrivant le rôle des autorités locales à chaque phase du cycle de la gestion des risques majeurs (identification des risques, prévention, préparation, gestion de crise, rétablissement et intégration des enseignements) et proposant certaines bonnes pratiques en la matière.  
*(le texte est en phase de révision et sera prochainement disponible)*

**LOCAL AND REGIONAL BODIES IN THE INFORMATION AND PREPARATION SYSTEM FOR EMERGENCY SITUATIONS (European Centre on Training and Information of Local and Regional Authorities and Population in the Field of Natural and Technological Disasters, Baku)**

**TARGET COUNTRIES :**

**LOCAL COORDINATOR:** ECMHT

**OTHER PARTICIPANTS :** AFEM, ECNTRM, GHDD, TESEC, Ministry of Emergency Situations of Azerbaijan Republic

**OBJECTIVE OF THE PROJECT**

***Global objectives :***

The goal of the project is the organization of an information system according to modern standards, the training of specialists in this sphere, the study of the experience of EUR-OPA member-countries with the purpose of risk management by municipalities, local and regional bodies and preparation of the population for protection.

***Specific objectives for 2006 :***

To use the experience of EUR-OPA member-countries in the newly established system of the Ministry of Emergency Situations of the Azerbaijan Republic.

**EXPECTED RESULTS IN 2006**

Organize and carry out in October a seminar on that subject in order to analyse the working normative documents in force and the required recommendations concerning new normative documents.

**ACTUAL RESULTS FOR 2006**

The planned activities have not been implemented in 2006.

**OPERATIONAL MANAGEMENT OF CRISIS – SIMULATIONS IN URBAN AREAS (European Centre on Urban Risks, Lisbon)**

**TARGET COUNTRIES :** France, Portugal, Morocco

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<sup>4</sup> 11ème Session ministérielle de l' Accord européen et méditerranéen sur les Risques Majeurs (EUR-OPA) : « La protection des sociétés contre les désastres a travers la préparation et la prévention: une priorité politique », Marrakech, 31 octobre 2006.

**LOCAL COORDINATOR:** L. A. Mendes-Victor

**OTHER PARTICIPANTS :** CEPRIS, CUEBBC; Civil Protection, Simulation-Emergency Sector, Geophysical Centres, Seismic Engineering.

## **OBJECTIVE OF THE PROJECT**

### ***Global objectives :***

Definition of scenarios concerning urban risks

### ***Specific objectives for 2006 :***

Historical Centres of Lagos (Portugal) emergency components behavior

## **EXPECTED RESULTS IN 2006**

Interactive Simulator to support the management of local emergency resources.

Analysis of urban policies (June-September)

Composition of aggregates (September-December)

## **ACTUAL RESULTS FOR 2006**

The planned activities have not been implemented in 2006.

## **INTERNATIONAL CONFERENCE " TWENTY YEARS AFTER CHERNOBYL ACCIDENT : FUTURE OUTLOOK" (European Centre of Technological Safety, Kiev)**

### **TARGET COUNTRIES :**

**LOCAL COORDINATOR:** Viktor Poyarkov

**OTHER PARTICIPANTS :** Governments of Ukraine, Belarus and Russian Federation; European Commission; International Atomic Energy Agency; World Health Organisation; United Nation Development Program; International Charitable Fund « Ukraine 3000 »; Institute of Radiation Protection (France); Institute of Nuclear Safety (Germany)

## **OBJECTIVE OF THE PROJECT**

### ***Global objectives :***

Its aim is to promote effective use of the experience gained for strengthening safety around the world. The Chernobyl accident has called for essential changes not only in Ukraine, but also in the whole world. The international regulation on radiation protection, national strategies concerning development of nuclear power, strengthening of nuclear safety, radioactive waste management have been revised. 20 years after is the right time to consider the efficiency of these measures in the world, to do so on the anniversary of the Chernobyl accident and to give an opportunity to the international community to discuss these difficult issues in Ukraine.

### ***Specific objectives for 2006 :***

The conference will promote an effective implementation of modern international experience in such areas as:

- Radiation protection of the population, participants of liquidation of emergency and environment from the consequences of the Chernobyl accident,
- Medical and biological consequences of radiation accidents, Chernobyl experience,
- Protection of the health of the participants of liquidation of consequences of the Chernobyl accident
- Strengthening of radiological emergency management,
- Economy and legal aspects of radioactive waste management, nuclear NPP decommissioning,
- Radioactive waste management, Chernobyl experience
- Nuclear power plants decommissioning, ChNPP decommissioning
- Transformation of Shelter to an ecologically safe system.

The conference section « Medical and biological consequences of radiation accidents » will be common with 11-th Coordination Meeting of WHO/REMPAN.

An independent component of the conference will be an international humanitarian forum "Rebirth, Renewal, and Human Development". The purpose of the Forum is to initiate a dialogue concerning the development of the man and society sustainable development, the strengthening of the responsibility of mankind and the readiness for prevention of accidents at different levels.

## EXPECTED RESULTS IN 2006

This conference will be the last in a sequence of conferences, forums and symposiums devoted to the 20<sup>th</sup> anniversary of the Chernobyl accident. On this occasion there will be a presentation of the conclusions of the International Conference "CHERNOBYL: Looking Back to Go Forward", held in Vienna, Austria on 6-7 September 2005, and of the conclusions of the conference held in Minsk on 19-21 April 2006 "20 years of Chernobyl accident, strategy of recovery and sustainable development of victim from Chernobyl accident of regions".

## ACTUAL RESULTS FOR 2006

April 26, 2006 was the 20th anniversary of the Chernobyl accident. The International Conference "Twenty Years after Chernobyl accident. Future Outlook" held 24-26 April 2006 in Kiev with the purpose of reviewing and better utilization of the experience gained from the accident enabling the world to be better prepared for any future accident of this magnitude.

This conference, organized by Ukraine in co-operation with Belarus, Russia, UNDP, IAEA, UNESCO, WHO, European Commission, Council of Europe, TESEC, IRSN (France) and GRS (Germany), elaborated on the conclusions of the Chernobyl Forum held 6-7 September 2005, Vienna, Austria and the International Chernobyl Conference "International Conference on the Occasion of the 20th Anniversary of the Catastrophe at the Chernobyl Nuclear Power Plant" held in Minsk and Gomel, Belarus, April 19-21, 2006.

It promotes an effective implementation of the accumulated international experience in the following areas:

- Radiation protection of the population and emergency workers, and the environmental consequences of Chernobyl accident,
- Medical and public health response to radiation emergencies,
- Strengthening radiological emergency management of radiation accidents,
- Economic and legal aspects of radioactive waste management and nuclear power plants decommissioning,
- Radioactive waste management: Chernobyl experience,
- Nuclear power plant decommissioning: Chernobyl NPP,
- Transformation of the Chernobyl Sarcophagus into an ecologically safe system.

The President of Ukraine, V.Yushenko, and other well-known politics, scientists and experts from 25 countries of the world, as well as many international organizations, participated to the Conference : more than 900 participants and more than 200 international journalists took part in the conference.

The Conference started by statements of Conference co-organisers:

- Ukraine, Belarus, Russia;
- UNDP (UN Coordinator of International Cooperation on Chernobyl);
- EU (Mr. Josef Pröll, Austrian Minister of Agriculture, Forestry, Environment and Water Management);
- EC;
- UNESCO (Mr. Koïchiro Matsuura, Director-General); IAEA (Mr. Tomihiro Taniguchi, Deputy General Director);
- WHO (Mrs Susanne Weber-Mosdorf, Assistant Director General for the Sustainable Development and Healthy Environments Cluster);
- Council of Europe (Mr. Eladio Fernandez-Galliano, Executive Secretary EUR-OPA Major Hazards Agreement).

The following keynote speeches by high level representatives of the Governments and International organisations were presented:

- Mr. Kenzo Kikuni, Chairman of Sasakawa Memorial Health Foundation
- Mr. Fabrizio Saccomani, Vice President EBRD
- Mr. Zenon Matkivsky, D.O., President & Chairman of The Board, Children of Chernobyl Relief and Development Fund
- Mr. Hiroshi Nakajima, Director-General Emeritus, World Health Organization
- M. Balonov, IAEA on Conclusions of the Chernobyl Forum and Conference "Looking Back to Go Forwards" (Vienna, September 2005) -
- Conclusions of an International Chernobyl Conference (Minsk/Gomel, April 2006)

Invited reports have been also presented on:

- Improvement of Nuclear Safety and Radiation Protection Initiated by the Chernobyl Accident (T. Taniguchi, IAEA)
- Strengthening of Emergency Response to Radiation accidents (R. Martinchich, M. Repacholi, WHO)
- Chernobyl NPP Decommissioning, Transformation of 'Shelter' into an Ecologically Safe System (V. Novak, EBRD)

- Efficiency of Measures on Minimization of the Consequences of Chernobyl Accident, International Experience (B.Priester, Ukraine, Belarus, Russia, UNDP)
- Chernobyl Radioactive Waste Management- Experience and Future Outlook (V.Shestopalov, Ukraine)
- Chernobyl and New Knowledge (L.Bolshov, Russia)

The other reports on conference have been presented in 4 sections:

T1. Consequences of Chernobyl accident for human, medical and social aspects.

T2 Chernobyl and environment, contaminated area rehabilitation

T3. Technological aspects of nuclear and radiation safety, Chernobyl experience

T4. Medical and Biological Consequences of Radiation Accidents (joint with REMPAN)

Conclusions and Recommendations of the International Conference "Twenty Years after the Chernobyl Accident: Future Outlook " have been developed.



## PREVENTION – INFORMATION

### **CAMPAIGN ON WARNING AND INFORMING THE POPULATIONS IN EMERGENCIES AT CENTRAL AND MUNICIPAL LEVELS: A BASIS FOR ESTABLISHING A REGIONAL WARNING SYSTEM IN TRANSBOUNDARY EMERGENCIES (European Interregional Educational Center for Training Rescuers, Yerevan)**

**TARGET COUNTRIES:** Armenia, the Southern Caucasus countries and neighbouring countries, states – members of EUR-OPA Major Hazards Agreement, other concerned countries.

**LOCAL COORDINATOR:** European Interregional Educational Center for Training Rescuers

**OTHER PARTICIPANTS :** Other interested European Centers; Emergency Management Administration (EMA) of the Ministry of Territorial Management (Republic of Armenia), Academy of Crisis Management (of EMA), “Emergency Channel” Information Agency (under EMA).

#### **OBJECTIVE OF THE PROJECT**

##### ***Global objectives :***

###### *Long-term.*

- Acquisition by the population of the Republic of Armenia of the required knowledge and fundamental skills in properly reacting when warned about an imminent hazard and in the case of specific risks. Achieving this goal requires the recurrent holding of the nation-wide Campaigns.
- Usage of the experience gained in training of the population of the Republic of Armenia in skills of behavior in times of disasters, shared by the Southern-Caucasus countries and adjacent states at organizing the similar Campaigns in neighbouring countries taking into account their specific geographical and ecological climatic conditions.
- Basing on the Armenian expertise development of a regional information and warning system for the populations of the Southern Caucasian countries and adjacent states about trans boundary emergencies.
- The methodic of the organization and holding of the National Campaign on warning and informing all social groups of the population, including local governance bodies in emergencies at national, regional and municipal levels presented in this project can be (after being appropriately polished up) submitted as an essential component for the development of regional and national early warning systems for other interested countries and regions.
- Profound mitigation of consequences and reducing of losses which likely to be caused by trans boundary emergencies.

###### *Short term.*

- Developing Methodic and Plan for actions aiming at developing and holding national and municipal “Campaigns” on informing and warning the populations about emergencies.
- Organization of a nation-wide Campaign on warning and informing of the populations about emergencies in order to keep the population of the Republic of Armenia informed on possible risks (ecological, industrial, nuclear, transport) threatening each particular country region and about what to do when warned on an imminent hazard and in the case of a particular disaster.
- As local governance bodies are the first who must protect the population, this Project has to be implemented at both central and municipal (local) levels. Leaders of local governance bodies, heads of schools, hospitals, polyclinics, industrial enterprises, offices and mass media are called to be engaged in the development and realization of this Project.

##### ***Specific objectives for 2006 :***

According to Phase 1: “Planning” of the Program, it has been calculated that it should be fulfilled during a minimum one year term, as Phase 2: “Preparedness” will last for 8-12 months (under circumstances that organization –technical provision systems are available in the country or organization-technical measures if they have not been carried out before are possible to be implemented).

As the Program’s development and implementation began in September 2005 and during a short period of time September –December the particular Clauses of Phase 1 :”Panning” were developed, “Methodic and Plan for actions aiming to develop and hold national and municipal “Campaigns” on warning and informing the populations about emergencies” were elaborated along with the preparation of some necessary information materials planned to be fulfilled in Phase 2: “Preparedness”, than in 2006 the remaining Clauses of Phase 1: “Planning” are planned to be implemented and further information material (in particular, an

information card: a “Leaflet: what to do first”; a short brochure: “Brief information about what to do first”; a more detailed brochure:” The priority for actions undertaken by the populations in the case of disasters that are likely to occur in Armenia” are planned to be developed and polished.

## **EXPECTED RESULTS IN 2006**

1. Discussions of the existing methodological and information material at the Scientific Council of the Crisis Management Academy and the Scientific Council of the Emergency Management Administration under the Ministry of Territorial Management with concerned specialists from Ministries and Departments, with representatives of municipalities at special risks, with the representatives of special targeted groups of the populations.
2. Update of the methodological and information material basing on the discussions outcomes.
3. Development of additional material for municipalities with special risks: probable radioactive contamination risk; enterprises producing, using or storing hazardous material; situated in reservoir prone flooding zones close to high pressure dams.
4. Developing information material for special targeted groups such as school and preschool administration, foreign speakers (employees of embassies, international firms and other organizations located in Armenia), rural communities presenting national minorities, ...
5. Approval of the methodological and information material (also the basis scenario, motto and emblem).
6. Consultations with the representatives of other ministries and departments concerning the set up goals.
7. Consultations with representatives of the regions (governors, mayors, communities’ leaders).
8. Consultations with non-governmental organizations.
9. Inquires on the readiness of schools to adequately perceive, prevent and respond if disasters are imminent. Survey of actions undertaken by administration and students in schools and in other education establishments; elaboration of recommendations to improve the preparedness.
10. Selective surveys among randomly chosen groups of population to clarify populations’ knowledge’s about what is being done concerning informing civilians on disasters : their awareness of risk levels in their neighborhood, their understanding of signals produced by sirens and other warning mechanisms, their capacity to respond adequately if warned about imminent specific disasters, ...
11. Development of the preliminary Action Plan.
12. Survey of press and other mass media and development of material needed in dealing with them.
13. Development of the final Policy Plan.
14. Preparation of this Plan to be considered and approved by the Government.

## **ACTUAL RESULTS FOR 2006**

### **Introductory remark**

It has been envisaged in 2006 to implement the main parts of Phase 1 “Planning” as well as some Clauses of Phase 2 “Preparedness”. But as “Analyses of the national informing and warning system”, who was planned to be addressed later within the Phase 2, has appeared as a key aspect for a final solution of the problem dealing with “a complete readiness of the communication and warning system for functioning”. Its delay may prevent some of the tasks of phase 1 from being performed in full, in particular “Developing a final version of the Plan to be considered and approved by the Government”. Thus a better analysis of the communication and warning system in Armenia and the extent of its operativeness has been included into 2006 activities.

### **1. The “Methodology and Plan for action” (MPA) and associated information materials have been discussed**

The materials developed in 2005 have been approved in 2006 after discussions with relevant units of the Rescue Service of Armenia and within the Crisis Management Academy’s Scientific Council Sessions involving specialists from other Ministries and Departments, representatives of municipalities at special risks and *ad hoc* targeted population groups. Some specific points have been highlighted:

- The MPA can be deemed as a significant compound aiming to establish municipal, national and regional early warning systems both in Armenia and in other concerned countries.
- The proposed informing and warning system (IWS) for Armenia can serve as a basis for a larger Southern Caucasus regional system for transborder emergencies through regional cooperation.
- The short Brochure is universal while the more detailed Brochure contains priority actions to undertake by threatened populations who can serve as basis for specific regional brochures.
- To prevent that both national and municipal Campaigns fail, the restoration of logistics for an IWS drawn on latest technologies needs to be promoted.
- One key goal of the National Campaign is to inform the whole population on existing risks and training them to adequate perception and behavior when warned on imminent disaster or when it occurred.
- Providing assistance to municipalities (specially those with special risk) in planning and holding of “Municipal Campaigns” is a top priority : a sufficient number of municipalities should have developed and held their “Local Campaigns” before the “National Campaign” launch.

## **2. Update and specification of the MPA has been continued.**

A new Section 0: “Priorities of regional cooperation of the countries of the Southern Caucasus and neighboring regions in transborder emergency management” has been developed and added to the MPA to consider risks threatening Southern Caucasus countries and regional cooperation links to reduce risks.

In particular, it focuses on regional cooperation in case of:

- emergencies (earthquakes, landslides, floods, etc.) occurring in the territory of one single country;
- transborder emergencies and reciprocal openness of the countries of the region;
- transborder emergencies under political tension conditions within countries of the region.

For each case, sources of risk, possible barriers to cooperation as well as mechanisms to overcome them have been considered in depth and it has been stated that the goal aiming to develop and implement the above “National Campaign” in Armenia extends beyond the national framework and reaches a regional nature.

Improvements of earlier distributed information leaflets (Information Leaflet on “What to do first”, short Brochure on “Brief information on priority actions” and detailed Brochure on “Prime actions undertaken by the communities at a threat of imminent disasters with potential to occur in Armenia”) are introduced.

## **3. Additional information materials for municipalities with special risks have been produced**

In the MPA, the need to develop three additional information modules for municipalities facing specific risks was emphasized: one for municipalities with likely radioactive pollution risk; another for municipalities with enterprises engaged into producing/using/storing hazardous substances; a third one for municipalities situated in flooding prone zones close to high pressure dams.

In 2006, the work focused on those three additional modules to enrich the “general” information materials. By taking into account the Armenian great vulnerability to seismic hazard and the lessons learnt from the 1988 Spitack earthquake, an additional Draft Guide in case of strong earthquakes have been also developed.

All additional information modules use the same basic scenario (message), motto and emblem that the one used in the “general” information materials for both national and municipal campaigns. They contain more detailed information such as : possible scenarios in the case of specific disasters; methods and mechanisms employed to warn the populations about disasters; preparation rules to behave adequately when a disaster strikes; behavior rules when a disaster is announced (in a preventive phase), when a disaster is effective (in an acute phase) as well as how to proceed in a recovery phase. The additional information material needs yet to be discussed with scientific employees and specialists and further polished according to their comments.

The Draft Guide on strong earthquakes has been translated into English and after its update will be submitted to the Agreement while the translation into English of the other three modules is underway.

## **4. Developing information material for targeted population groups**

Additional information material for school- and pre-school institutions, both for its staff and for pupils has been developed. Even if general informational material can be used by them and the detailed brochure contains specific recommendations for schools (in particular the “Behavior rules during earthquakes” section), they need more detailed education and methodology information material.

The ECTR has continued to develop a textbook for schools, “Basis of safe living in extreme situation”, based on more than 30 already existing brochures containing relevant sections dealing with that topic but updating them with experience drawn from pilot teaching in Armenian schools.

Associated training programs have been developed and included in school curricular; textbooks for the 8-9-10-th forms of the secondary school have been published as “Basis for civil protection and emergencies”;

In 2006, ten new Sections have been developed (among them extreme situation assessment, possible ways out, accidents and man-made disasters, recommendations on ensuring secure housing). Specific chapters on extreme psychology, teaching methodology, healthy mode of life, ... have also been developed.

Additional material for schools and pre-school establishments has been produced by the State Crisis Management Academy. Five books (in total 15 000 copies) on various types of disaster risks have been published with the active participation of the Red Cross of Armenia. An anthology of educating poems for children (1000 copies) has been published and delivered to schools and kindergartens. A drawings’ competition for school age children (with 300 participants) dedicated to natural and technological risk issues has led to publish a calendar with the best drawings.

Two training cartoons have been created and delivered to more than 30 schools and pre-school institutions while three video films have been created and dozens of training video pictures have been edited. Various competitions, quizzes and visiting training sessions have taken place in Yerevan and in several regional schools. A methodology for school staff to promote teaching this subject has been also prepared and they have been trained on a regular basis at the State Crisis Management Academy.

## **5. The basic scenario, Campaign’s motto and emblem have been agreed upon**

The basic scenario (a message) that everyone should pursue is the following: *“When siren sounds, enter the nearest building immediately; close all doors and windows, turn on the radio and/or TV and wait for further instructions”*. One of the main reasons for choosing this simple scenario is that it is applicable for

almost all potential types of disasters in Armenia and it is valid both for the national and municipal Campaigns, allowing to be mutually supported and enhanced.

As mentioned in the MPA, the Project aims to raise the awareness of every citizen on what he/she should do in the case of an imminent disaster: it focuses on early warning people in a preventive phase. Unfortunately, in cases of earthquake, it is still premature to speak about early warning and people have also to be informed on methods to warn them on real disasters and on what to do in such situation.

So information also has to be conveyed to people in an acute disaster phase (the real disaster situations), being launched unforeseen and involving local sirens to start immediate evacuation: this requires is a quite different kind of scenario with the possibility to be built into either regional (municipal) information material (leaflets, cards containing instructions, booklets, brochures, broadcasting texts for local (regional) radio and TV shows) based on general (national) information material and corresponding to better and more concrete options adjusted to local special features or options developed to supplement the national ones.

Relying on Bible's episode on detailed description of early warning and preventive measures enabling to be prepared to the Deluge, the proposed emblem of the Campaign is a picture of "Noah, descending Mount Ararat", accompanied by the agreed motto of the Campaign, "Who is warned is protected: if you know what to do in the case of disasters, you will save your own life and those of your relatives", and a quotation of God's warning message to Noah. It will appear in all information brochures' covers.

## **6. Consultations with other Ministries and Departments regarding the set tasks**

## **7. Consultations with regional officials, governors, mayors and communities leaders**

## **8. Consultation with nongovernmental organizations**

As noted in the introductory remark, it needs firstly to analyze the communication and warning system in Armenia and the extent to which it is ready to function. The Armenian early warning system can be divided into two main components :

- the EWS for top/medium governance with dedicated telecommunications based on the 24 hours/7 days a week warning service of the Rescue Service of Armenia (Ministry of Territorial Administration)
- the centralized EWS for population using sirens and telephone lines

If the first component works properly, the second one covers only 30% of the total territory: such partial functioning of centralized warning system will delay the "National Campaign". The Rescue Service of Armenia has analyzed the communication and warning system in depth and is now holding consultations with other concerned Ministries and Departments in order to update it through modern communication technologies proposed by the ECTR. Within the 2007 budget, the Government agreed to allocate funds to enable urgently the update in most mountainous regions of the country.

The ECTR has focused on organizing regional and municipal Campaigns and 2 exercises took place in 2006 :

1. A three-levels (national, regional and municipal) training exercise on "Response to an accident at the Armenia nuclear power plant" (Armavir region, 26-27 October)

The goals of that two stage training (preparatory work and training exercise) were :

- To examine and update the skills and abilities of state management and local bodies enabling to ensure the protection of population in the case of an off design basis radiological accident;
- To enable management bodies and response units to fulfill practical tasks during emergencies.

A high level of preparedness was demonstrated by all participants (heads of Ministries and Departments, Territorial Administration- and local self government bodies) but an array of serious gaps (in particular on warning populations) have been identified and a recommendation on how to fill them was formulated.

2. A headquarter exercise on "Organizing and providing governance to protect the community in the case of accident at a pure ferrous plant" (Yerevan, 21-22 June)

Yerevan mayor's office and regional municipalities, as well as school officials and pupils from school N 178 and "Erebumi" community medical college students, participated to that exercise who had two main targets:

- to examine how civil protection governance bodies in Yerevan and "Pure Iron Works" can collaborate if an accident at a chemically hazardous installation occurred;
- to enable the permanent Commissions on emergency related issues operating in Yerevan and "Pure Iron Works" managers to muster practical skills in responding to consequences of such accident.

## **9. Basic tests and general recommendations on safety in schools have been developed**

Within the 2006 basic activities (see the document AP/CAT(2007)? for details), the ECTR has collaborated to two actions contributing indirectly to the National and Local Campaigns :

- A Program on tests and recommendations for schools' to assess their safety and preventive measures in case of emergencies (both natural or man-made).

The tests enabled to assess the level of preparedness, safety and readiness to adopt preventive measures and results were translated in recommendations for school administration, teachers, students and their parents on how to increase that preparedness.

- An education manual - brochure "Earthquake", developed by the State Crisis Management Academy, the National Seismic Protection Service

Published with support of the IFRC and the Norwegian Red Cross, this manual wishes to increasing awareness of population about adequate actions in case of earthquake and includes a feedback driven questionnaire at the beginning and at the end of the manual to assess their increased knowledge on the topic.

#### **10. Survey of randomly chosen groups of population to clarify the level of knowledge of populations concerning information on disasters**

Are the populations aware of the level of risks present in their neighborhood? Do they know the meaning of signals produced by sirens and other warning mechanisms? To what extent they have been informed and trained to be able to respond adequately if warned about imminent specific disasters? To have some insights, participants to training programs of the State Crisis Management Academy and to the two previously described exercises were used as samples.

Their answers revealed a rather high level of awareness in top- and medium state management bodies and in various groups of trainees of the State Crisis Management Academy. Awareness in heads and specialists from local self governance bodies and in populations of municipalities at special risk can also be considered acceptable even if it has to be improved for populations of more than 25 rural and urban municipalities near the Armenian nuclear power plant and in areas with severe exposure to flood risk.

#### **11. Developing preliminary actions Plan**

The Planning Phase of the proposed pilot Draft Project of the “National and municipal Campaign” includes in particular the following aspects:

- Developing Draft Plan on elaborating strategy
- Approving and adopting of this Plan by the Government

A clear decision by the Government on holding national and municipal Campaigns on informing and warning the populations about emergencies is thus vital. However, before the “National Campaign” is launched, a sufficient number of municipalities have to start their Local (municipal) Campaigns.

#### **12. Developing materials required to work with medias**

Two main actions had been developed in 2006 related to that specific topic :

- A “Crisis management” workshop (Yerevan, 4-5 December 2006)

Its goal was to imagine an “Armenia crisis management structure” and to discuss its implementation. Three modules of the workshop were specially relevant:

*Situation awareness* (key actors during emergency: local, regional and national levels; inter-level–synergy; information required at different management levels; ways to gather information for a consolidation)

*Public information in crisis or emergencies* (guidelines for public information; working with the media during an emergency; how can the media contribute to emergency management)

*Information exchange in an emergency* (available means during an emergency)

- An Information Center “Emergency channel”

Under the aegis of the Rescue Service of Armenia, it should operate as an Information Center in preventive phase and serve as “National Center on informing populations” during disaster phase. With financial support of USAID and UNDP, that unique Centre in Southern Caucasus with renewed premises and equipment has been inaugurated on 7/12/2006, anniversary of the Spitak earthquake. The complex consists of Information, Briefings, Telecommunication and Computer centers and provides all necessary conditions to prepare TV broadcasting programs and to publish information material. It can thus be a useful organizational and technical support for holding the national and municipal “Campaigns”.

#### **13. Developing a final option of a Plan for action.**

#### **14. Preparing this Plan to be viewed and approved by the Government.**

The MPA and the associated “basic information materials” have been discussed and approved by relevant units of the Rescue Service of Armenia (Ministry of Territorial Administration) and by State Crisis Management Academy’s scientific sessions involving specialists from other ministries and departments, officials from municipalities at special risk and representatives of targeted population groups.

Prior to develop a “Final option of a Plan for action” to be approved by the Government, a decision about the needs and opportunities to develop and hold regularly national and municipal “Campaigns” is needed and preliminary work to develop national-, region- and local- wide material (with information about risks and adequate population response) and material-technical basis through use of modern technologies must be continued.

### **DANUBE A RIVER FOR ALL, A CARE FOR EVERYBODY (European Centre for risk prevention training at school level, Sofia)**

**TARGET COUNTRIES:** Bulgaria, Romania, Moldova, Ukraine, Hungary, Austria, Germany, Croatia, Serbia  
**LOCAL COORDINATOR:** European Centre (CSLT), Sofia

**OTHER PARTICIPANTS :** European Center in Moldova, European Center in Ukraine, TESEC, European Institute for Eco-Counseling, Strasbourg (France)

**COUNTRIES AUTHORITIES:** Bulgarian National Radio

## **OBJECTIVE OF THE PROJECT**

### **Global objectives :**

Sustainable development information and risk prevention awareness using radio-Programs for children at school level.

### **Specific objectives for 2006**

Information and risk prevention awareness and sustainable development.

## **EXPECTED RESULTS IN 2006**

15-16 May 2006: Organization of a working session to define the topics to be taken up in priority in order to initiate the first "DRACE" Radio-Programmes.

June-October 2006: Preparation of the content of the first "DRACE" Radio Programme, interviews etc.

October – December 2006 Broadcasting of the first DRACE Radio Programmes.

Evaluation of the broadcasted DRACE Radio Programs, drafting of the assessment report to be sent to the Executive Secretary of the EUR-OPA Major Hazards Agreement of the Council of Europe.

## **ACTUAL RESULTS FOR 2006**

The International Seminar "Prevention against the water harmful influence and information of the population along the Danube river valley" organized by European Center for Risk Prevention (CSLT), Sofia of the EUR-OPA Major Hazards Agreement of the Council of Europe in cooperation with the Parliament Commission for Ecology and Ministry of Environment and Waters in Bulgaria. took place in Sofia, Building of the Parliament, Hall "East", the 4<sup>th</sup> December 2006.

The participants having taken into account that the aims of the meeting were:

1. To discuss how to improve the monitoring and information systems in case of flood and ecological pollution and their implementation in real time.
2. Evaluate the level of vulnerability of the river sections to floods.
3. Identify the conditions to set up systems for early warning and forecast of floods along the Danube.
4. Specify the role of media to inform and train the affected population in case of flood.

### *Considering:*

1. the importance the President of the Parliamentary Committee for Environment and Water-Mr. Georgi Bozinov attached:
  - a. to the improvement of the situation concerning the management of the water in the Danube Basin in particular concerning the floods problems which has to be set up at the level of a joint approach between the different Countries belonging to the Danube River Basin
  - b. to the spirit of the basic European Union Directives concerning water related problems, the future EU Directives concerning Floods supported by the EU Council on November 2006 and the EU Document adopted in 2003 concerning the Best Practices for Floods Prevention, Protection and Mitigation.
  - c. his readiness to support from a Parliamentary point of views the conclusions and proposal resulting from the discussions.
2. The special concern the President of the European Commission M. J. Barroso , as indicated by J.P. Massue (European Academy of Sciences and Arts), is giving to the "climate change" leading for example for the countries of the South of the Mediterranean basin to an increase of the desertification process and for the countries of the North of the Mediterranean basin to an increase of the severity and frequency of floods and looking to launch an initiative to decrease the CO<sub>2</sub> emission at "global level".

### *Following the presentation and discussions of the following contributions:*

- Present water management. Water framework directive 2000/60/EC. Implementation in Bulgaria. Requirements of the Danube river convention (*Mr.Vl. Donchev, Director of Department "Water", Ministry of Environment and Water*)
- Critical levels threatening the watersides-river Danube (*Mr. G. Georgiev, Executive Agency For Exploration And Maintenance Of The Danube River – Ruse, Ministry of Transport*)
- Development of river morphological process and its influence on the maximum water level at the Bulgarian-Romanian watersides of Danube river (*Associated Prof., Dr.Eng. Stefan Modev; Eng. Sivilia Kiriliva, Eng. Konstantin Yalamov*).
- Risk activities in region Danube valley and the Geo-police aspects of the security (*Prof. Dimitar Yonchev, New Bulgarian University*)

- Pool management of waters in Bulgaria, challenges and achievements (*Eng. Ts. Dimitrova, Director Pool Direction, Danube region*);
- Problems of flood management along Danube river watersides (*Mr. Andrej Ivanov, Director of Direction Civil Protection*)
- Organization and exploitation of the hydro technical prevention equipment along Danube river- main factor for flood prevention of the Danube river sides (*Dr. Ignat Ignatov, Engineer Angel Zahariev, UACEG*)
- Conception for building up of national system for aerospace monitoring (*Professor G. Sotirov, Bulgarian Academy of Science, Space Research Institute*).
- Information and communication security at ecological pollutions (*Russy Marinov, New Bulgarian University*)
- Initiative of the Bulgarian National Radio, "Danube River for everyone and everyone's care DRACE Project" (*Mr. Ivan Angelov, Bulgarian National Radio*)
- European Concern for water management in the Danube River Basin (*J.P. Massue, European Academy of Sciences*).

*Approved the following conclusions:*

- Gave their appreciation for the high scientific and technical quality for the different communications presented during the International seminar,
- Regretted that countries like Romania declined the invitation to take part in this very valuable exchange of views,
- Supported the project presented by the Bulgarian Space Agency to launch a "Bulgarian Micro Satellite" passing 8 times per day over the national territory which can represent a very significant tool to help for decision making in risk prevention, protection and mitigation,
- Welcomed the proposal to initiate a "specific radio Programme" at the initiative of the Bulgarian national radio in cooperation with the countries of the Danube Basin River. Interested for a lot of Districts and Municipalities along river Danube.
- Supported the proposal presented by J.P. Massue to create a "Web TV" for and by the Children of the countries of Danube Basin river taking into account the initiative taken by France in creating such "Web TV" for and by the Children using the "Cyber-Base Programme" of the Caisse des Depots et Consignation, the French Ministry for Ecology and Sustainable Development and the IF-FORME Association. They welcomed the idea to start with a "Demonstration project" of a specific TV project initiated by the Algerian Mediterranean Center in Biskra (Algeria) on Climate change and desertification and the equivalent on floods initiated under the auspices of the European center CSLT in Sofia.
- To organize such seminars annually : next seminar to be held on first half 2006, of the town next to river Danube, with participation of Intergovernmental Commissions of Bulgaria and Romania.
- Gave their appreciation and thanks for the high quality preparation and management of this meeting organized by the Director of the European center on Risk Prevention CSLT, M. Kolio Kolev.

### **INFORMATION DES POPULATIONS SUR LES RISQUES MAJEURS (*Observatoire euro-méditerranéen sur la gestion des risques, Montpellier*)**

**PAYS CIBLES :** Pays de l'Accord hors Union européenne (Albanie, Algérie, Arménie, Azerbaïdjan, Bulgarie, Croatie, Géorgie, Liban, Fyrom, Moldavie, Maroc, Roumanie, Russie, Turquie, Ukraine)

**COORDINATEURS LOCAUX:** ECNTRM, ECTR, GHHD, ECMHT, CEPRI, ECRP, CRSTRA, TESEC, ECILS, ECMNR, ECBR

**AUTRES PARTICIPANTS :** EMORI, ISPU, Ministères français, espagnol et belge

### **OBJECTIF DU PROJET**

#### ***Objectifs globaux:***

La délégation générale environnement de la Commission européenne a lancé une consultation pour l'élaboration, d'une part, de pictogrammes d'information, au niveau de la population, sur les risques naturels et technologiques et, d'autre part, de modalités d'alerte. Un certain nombre de propositions sont en cours de validation. Au niveau de l'UE, l'affichage des aléas et des consignes individuelles en cas d'alerte ou de danger fait partie de la mise en place des lois sur la prévention des risques technologiques et naturels, à la réparation des dommages et sur la démocratie de proximité.

L'Observatoire a effectué l'inventaire des modalités d'affichage dans les pays européens et méditerranéens hors de l'Union européenne (voir Rapport 2005 ; point 2.3). On constate une absence pratiquement totale de ce type d'information des populations.

L'Observatoire propose d'utiliser le réseau de l'Accord pour aider à diffuser, sous une forme adéquate et en direction des partenaires institutionnels concernés de ces pays complètement démunis de tout affichage et consignes, les informations concernant pictogrammes et systèmes d'alerte mis en place en UE. Une collaboration de l'Observatoire est déjà en cours avec les ministères et les services de la sécurité civile

français, belges et espagnols. Les Centres spécialisés de l'Accord pourraient en être les relais locaux. La participation des Correspondants permanents est indispensable à plusieurs égards et notamment pour aider les pays à souscrire au niveau national à ce projet et à y participer activement. Les services concernés dans les pays, notamment ceux de sécurité civile, ont été déjà sensibilisés lors de l'inventaire effectué par l'Observatoire en 2005.

Ces objectifs s'inscrivent dans les priorités du Plan à Moyen Terme, définies à la réunion des Correspondants permanents de Lisbonne :

- « sensibiliser et éduquer les populations et les intervenants en matière de gestion des risques à la manière dont réagir en cas de catastrophe » ;
- cette action répond également aux préoccupations de l'Accord concernant les aspects législatifs et normatifs et leur analyse comparative avec les directives et normes européennes ;
- le projet s'inscrit enfin dans une volonté d'harmonisation de programme avec ceux de la Commission européenne.

Sur le plan organisationnel, il convient de souligner que cette action renforce la coopération sur des thèmes communs entre les différents Centres de l'Accord suivant la recommandation de la réunion de Lisbonne.

#### **Objectifs spécifiques pour 2006 :**

- Identification des partenaires dans les pays concernés et présentation du programme de travail
- choix des informations : pictogrammes d'information, pictogrammes de comportement, systèmes d'alerte...
- Préparation des documents à diffuser
- Diffusion et accompagnement de la diffusion

#### **RESULTATS ATTENDUS EN 2006**

- reconnaissance du partenariat dans les pays concernés 02-04/2006
- choix des informations: pictogrammes d'information, pictogrammes de comportement, systèmes d'alerte... 04-06/ 2006
- Préparation des documents à diffuser 07- 10/ 2006
- Diffusion et accompagnement de la diffusion 11-12/ 2006

#### **RESULTATS EFFECTIFS POUR 2006**

Les difficultés qui ont amené le Centre à demander à ne plus faire partie du réseau des Centres de l'Accord a empêché que cette activité ait lieu.

#### **SPECIAL SESSION ON HAZARDS IN THE INTERNATIONAL CONFERENCE ON DEVELOPMENT OF SUSTAINABLE TOURISM IN EURO-MEDITERRANEAN COASTAL ENVIRONMENT (Euro-Mediterranean Centre on Insular Coastal Dynamics, Malta)**

**TARGET COUNTRIES :** International

**LOCAL COORDINATOR:** Dr. Anton Micallef, ICoD

**OTHER PARTICIPANTS :** Directors of Specialised Centres invited to participate / present communications, Decision / policy makers among target audience.

#### **OBJECTIVE OF THE PROJECT**

##### **Global objectives :**

The objective of this bi-annual conference series is to focus on selected aspects of coastal management, namely those related to the recreational amenities represented by beaches, yacht marinas and ecotourism amongst others. A special session on hazards associated with recreational tourism is planned.

##### **Specific objectives for 2006:**

The Conference aims to bring together researchers as well as practitioners and policy makers to highlight and discuss issues of concern while also showcasing appropriate solutions through the exchange of experiences, best-practice scenarios and innovative management concepts.

#### **EXPECTED RESULTS IN 2006**

- Organisation of a 3 day conference (25 – 27<sup>th</sup> October, 2006, Gozo).
- Printing and dissemination of conference proceedings.

#### **ACTUAL RESULTS FOR 2006**



During that bi-annual Conference, almost 50 presentations covering the various topics of the agenda were presented. Among them, many presentations emphasized the vulnerability of coastal resources, in particular in terms of erosion, who can have major socio-economic impacts on population (as 60% of the world population lives along the coastal fringes).

*(The full conference proceedings have been published and can be directly requested to ICoD)*

**BASE DONNEES RISQUES TOXICOLOGIQUES TOX-IT (Centre Européen pour la Médecine des Catastrophes, San Marino)**

**PAYS CIBLES :** International

**COORDINATEUR LOCAL:** CEMEC

**AUTRES PARTICIPANTS :** Université Catholique de Rome (Poison Center), Université de l'Arizona (USA)

**OBJECTIF DU PROJET**

***Objectifs globaux:***

Education sanitaire dans les emergences toxicologiques

***Objectifs spécifiques pour 2006 :***

Elargissement du web site en langue anglais et polonais

**RESULTATS ATTENDUS EN 2006**

Diffusion de la banque des données et web site en Europe et dans les Pays du bassin Méditerranéen

**RESULTATS EFFECTIFS POUR 2006**

[www.tox.it](http://www.tox.it) has been published in the web with the technical co-operation of InfoLearning, a specialised company for information and knowledge diffusion via web. The Pages are on line since March 2005. From then on both occasional visitors and registered users have been increased. During the last six months, the average number of accesses is around 3000 per month including 80 % from Italy IP and 20 % from IPs outside Italy.

The english version of TOX IT is under construction and the layout resembles the Italian Version. The English Version of TOX IT will be available by January 31 2007 at [www.en.tox.it](http://www.en.tox.it) or [www.toxit.eu](http://www.toxit.eu)

## AUTRES SUJETS / OTHER TOPICS

### **VILLES, ENVIRONNEMENT ET ECOTOURISME EN ZONES ARIDES (Centre Scientifique et Technique sur les Régions Arides, Biskra)**

**PAYS CIBLES:** Algérie, Maroc, Tunisie, Italie, France, Espagne, Grèce, Egypte, Syrie

**COORDINATEUR LOCAL:** Dr LAKHDARI FATTOUM Directrice Générale du CRSTRA

**AUTRES PARTICIPANTS:**

**CENTRES SPECIALISES:** Universités algériennes et Centres de Recherches.

**AUTORITES NATIONALES:** Ministère de l'Enseignement Supérieur, Ministère du Tourisme, Ministère de l'Environnement et de l'Aménagement du Territoire, Autorités Locales.

#### **OBJECTIF DU PROJET**

##### ***Objectifs globaux:***

Identification en matière de priorités, d'évaluations des risques culturels et développement, intégration du savoir faire local dans le cadre d'un développement durable.

- 1- Recensement et revalorisation des ressources locales durablement
- 2- Recherche et création des ressources locales nouvelles
- 3- Développement d'un tourisme durable
- 4- Développement de l'artisanat comme activité durable et ressource économique

##### ***Objectifs spécifiques pour 2006 :***

- Recenser l'information scientifique ;
- Tirer des enseignements des expériences des uns et des autres ;
- Développer le travail en réseau entre chercheur.

#### **RESULTATS ATTENDUS EN 2006**

Atelier en Octobre (3 jours de cours intensif + débat général) pour :

- identifier les potentialités en matière de développement durable des ressources naturelles des spécificités locales et du savoir faire ancestrale ;
- récolter l'information scientifique en matière de gestion et de valorisation de l'environnement des villes en zones arides ;
- formation des cadres des autorités locales concernés par la gestion des ressources naturelles dans le cadre d'un écotourisme.

#### **RESULTATS EFFECTIFS POUR 2006**

Des difficultés organisationnelles ont empêché que cette activité ait lieu en 2006.

### **MONITORING OF FOREST FIRE SMOKE IN DIFFERENT FOREST FIRE SCENARIOS AND POSSIBLE HEALTH IMPACTS ON THE FIREFIGHTERS AND POPULATION (European Centre on Forest Fires, Athens)**

**TARGET COUNTRIES :** Countries very much at risk on forest fires (France, Spain, Italy, Portugal, Greece)

**LOCAL COORDINATOR:** Greece

**OTHER PARTICIPANTS :** Germany, Belgium, Morocco, Russia, Ukraine; joint effort among relevant interested centers of the Eur-OPA (France, Lisbon, Ukraine, Russia, Belgium, Morocco); Civil protections, firebrigades, Institutes.

#### **OBJECTIVE OF THE PROJECT**

##### ***Global objectives :***

1. On-line monitoring of forest fire smoke in various scenarios of forest fire
2. Forest fire smoke health impact on exposed population and the fire-fighters

##### ***Specific objectives for 2006 :***

1. To study health impact of forest fire smoke on population and fire-fighters

2. To define the specifications for field devices (chemical, optical, e.t.c.), used for monitoring air-quality in a forest fire incident
3. To develop a decision chart for crisis managers -evacuation criteria and procedures in case of big fires

#### **EXPECTED RESULTS IN 2006**

1. Review on health impacts especially of forest fire smoke on fire-fighters and population
2. Specialized report on air quality indicators for monitoring and estimating the severity of the situation in the affected areas
3. Technical report on specifications of instruments for on-line monitoring forest fire smoke near the fire front and in a distance
4. Specialized report on decision chart (road-map) for crisis managers with possible composition of forest fire smoke and safety issues in regard to different forest fire scenarios

#### **ACTUAL RESULTS FOR 2006**

The report "Vegetation Fire Smoke : Nature, Impacts and Policies to Reduce Negative Consequences on Humans and the Environment", prepared by Miltiadis Statheropoulos (ECFF, Athens, Greece) and Johann Goldammer (GFMC, Freiburg, Germany), reviews the character, magnitude and role of pyrogenic gaseous and particle emissions on the composition and functioning of the global atmosphere, human health and security.

Special emphasis is given on radioactive emissions generated by fires burning in peatlands and on terrain contaminated by radionuclides. The transboundary effects of VFS pollution are a driving argument for developing international policies; to address the underlying causes for avoiding excessive fire application and to establish sound fire and smoke management practices and protocols of cooperation in wildland fire management at international level.

Historically, knowledge regarding vegetation fire smoke has been acquired through observations and measurements on smoke produced in real forest/vegetation fires, as well as from experiments in wind tunnels and prescribed burning. All these have established the basic knowledge regarding vegetation fire smoke formation, composition and transportation.

Moreover, recent studies using new approaches, methods and considerations have enhanced relevant knowledge and offered new potentialities. The state-of-the-art knowledge on VFS consists, among others, of better understanding the generation and transport of VFS components, advanced specialized monitoring methods, novel methods for monitoring human exposure, new approaches for toxicity assessment, as well as, novel methods for coping with VFS impacts.

In addition, new methods can be used for evaluating VFS health, environmental and infrastructure impacts (novel methods of monitoring exposure, new biomarkers, synergy with urban pollution, quantification of VFS contribution to the anthropogenic greenhouse effect).

Moreover, new approaches have been proposed and tested in coping with VFS impacts (novel personal protective equipment, specialized transport modelling, state-of-the-art methods of monitoring smoke transportation and dispersion, coping with irregularities in operation of critical infrastructures).

It appears that all these new methods, approaches, and considerations regarding VFS have many advantages but they also create scientific, operational, technical and organizational challenges.

VFS is thus a complicated mixture with serious impacts on the environment and human health. Strategies and tactics exist to cope with its impacts. However, a number of issues are still open for further elaboration and decision making.

Due to the direct and indirect health and environmental impacts of VFS early identification of the situation is necessary for effective coping with the impacts. Early warning systems may provide effective tools for fire and smoke management in local, regional, and global applications.

Information on current weather and vegetation dryness conditions provides with the starting point of any predictive assessment. From this information, the probability of the risk that a wildfire will start and the prediction of the possibility of current fire's behaviour and fire's impacts can be derived. Short- to long-range fire weather forecasts allow for assessing the fire risk and severity within the forecasting period.

Advanced space-borne remote sensing technologies allow for fire weather forecasts and vegetation dryness assessment, covering large areas (local to global) at economic levels and with accuracy that otherwise cannot be met by ground-based collection, and dissemination of information. Remote sensing also provides with capabilities for detecting new wildfires, monitoring ongoing active wildfires, and in conjunction with fire weather forecasts, an early warning tool for assessing extreme wildfire events.

*(the full final version of the report will be published as an AP/CAT in 2007 and presented at the 4th International Wildland Fire Conference)*

## **PRÉVENIR LES DESASTRES NATURELS AU TRAVERS DE LA REMISE EN VALEUR DES CULTURES LOCALES DU RISQUE (Centre Universitaire Européen pour les Biens Culturels, Ravello)**

**PAYS CIBLES :** Italie, Grèce, Algérie, Maroc

**COORDINATEUR LOCAL:** Prof. Ferruccio FERRIGNI

**AUTRES PARTICIPANTS:** ECPFE, CEPRIS, CRSTRA, BE-SAFE-NET ; Dipartimento Protezione Civile (Italia)

### **OBJECTIF DU PROJET**

#### **Objectifs globaux:**

Réduire l'impact des désastres naturels au travers de l'étude, la remise en valeur et l'up-grade des techniques traditionnelles de transformation du territoire

#### **Objectifs spécifiques pour 2006 :**

- 1) Définir les guidelines de l'action
- 2) Organiser un cours sur le retrofitting approprié du bâti ancien au travers de la récupération de la Culture Sismique Locale

### **RESULTATS ATTENDUS EN 2006**

1. Identification des potentialités d'une action de remise en valeur des techniques traditionnelles d'aménagement du territoire
  2. Formation de 10-15 formateurs dans le domaine du retrofitting approprié du bâti ancien
  3. Mise en route des actions locales
- Workshop de définition des guidelines (13-14 Oct. 2006)
  - Cours intensif « Réduire le vulnérabilité du Bâti ancien au travers de la remise en valeur des cultures sismiques locales » (11-17 Oct. 2006)

### **RESULTATS EFFECTIFS POUR 2006**

Le Séminaire s'est déroulé sur deux journées (24-25 octobre 2006). La première a été restreinte aux représentants des Centres et aux experts invités (travail scientifique), la deuxième a été organisée sous forme de Table Ronde, avec la participation de représentants d'institutions internationales et de la Région Campania, et elle a été ouverte au public (perspectives politiques).

#### *Vendredi, 24 Novembre 2006*

- Cultures locales du risque et territoire historique: problèmes de reconnaissance, de sauvegarde, d'exploitation (F. Ferrigni)
- Le tecnico locali : un sapere negletto, una risorsa preziosa (S. D'Agostino)
- L'action des Centres EUR-OPA dans la prévention des risques:
  - Sismique : G. Papadopoulos (ECPFE - Grèce) et El Mouraouah (CEPRIS- Maroc)
  - Désertification : F. Lakhdari (CRSTRA - Algérie)
  - Glissements de terre et stabilité du sol : A. Sursok (CNG-Liban)
  - Formation: G. Gerosimou (BE SAFE NET- Chypre),
- Techniques traditionnelles de prévention des risques naturels dans les pays de la Méditerranée:
- La gestion des eaux au Magreb (M. I. Hassani)
- Le bâti historic au Maroc (O. Hassouni)
- Byzantine and postbyzantine antiseismic constructional techniques : the Mount Athos monasteries example (P. Touliatos)
- Les effets du « renforcement » parasismique en Ombrie (A. Cesi)
- Techniques traditionnelles de prévention des risques: procédures à haute intensité de travail, outils pour le développement humain, défi pour la formation universitaire (L. Carrino, Comité Scientifique ART et S. Swartz, UNDP)

#### *Samedi, 25 Novembre 2006*

Table Ronde: LA CULTURE LOCALE DU RISQUE DANS LA MEDITERRANEE: UN OUTIL CONTRE LES DESASTRES, UN ENJEU POUR LA FORMATION

Participants :

- L. Carrino (ART)
- A. Cesi (MiBAC)
- S. D'Agostino (C.I.Be.C)
- E- Fernandez-Galiano (EUR.OPA)
- A. Grimaldi (Regione Campania - Assessorato al Bilancio, Tributi e Rapporti con il Mediterraneo)

G. Luongo (Università di Napoli)  
M.-P. Roudil (UNESCO)

A la première journée du Séminaire ont pris part 14 experts et responsables des Centres, provenant de 6 Pays méditerranéens (Algérie, Maroc, Liban, Grèce, Chypre, Italie, France). Après avoir situé le Séminaire dans l'action de EUR-OPA Risques Majeurs et l'énoncé des thèmes et questions à aborder, les représentants des Centres ont décrit les actions que chaque Centre mène dans son domaine spécifique. Ensuite les experts ont illustré les techniques traditionnelles que dans leurs pays d'origine les populations ont mis en place pour réduire l'impact des désastres naturels (tremblements de terre, sécheresse, inondations, glissements de terre).

A la Table Ronde du 25 novembre ont pris part les représentants de 17 Institutions. Après une introduction qui a fait la synthèse des acquis du jour précédent, les participants à la Table Ronde ont illustré les possibilités d'insérer les thèmes abordés dans le Séminaire dans les actions en cours ou en projet par leur institution d'appartenance. L'analyse des perspectives globales du projet dans la politique de EUR-OPA Risques Majeurs a clôturé la séance et le Séminaire.

Presque tous les participants ont donné une copie numérique de leur présentation. Un rapport scientifique qui synthétise les acquis du Séminaire et les perspectives du projet sera édité en français et anglais. Par ailleurs, tous les documents produits par les participants seront rassemblés sur CD, qui sera transmis aux intervenants et mis à la disposition de EUR-OPA Risques Majeurs lors de la réunion des Directeurs des Centres.

**EFFETS DE SITE AU GRAND-DUCHÉ DE LUXEMBOURG - ETUDE  
COMPLEMENTAIRE POUR EVALUER LES ALEAS ET RISQUES SEISMQUES  
(European Centre for Geodynamics and Seismology, Walferdange)**

**PAYS CIBLES :** Grand-Duché de Luxembourg  
**COORDINATEUR LOCAL:** ECGS  
**AUTRES PARTICIPANTS :** Observatoire Royal de Belgique

**OBJECTIF DU PROJET**

***Objectifs globaux:***

Une étude préliminaire sur les effets de site au Grand-Duché de Luxembourg fut effectuée en décembre 2005 avec le soutien financier de l'EUR-OPA Risques Majeures. Nous proposons de poursuivre l'étude afin d'évaluer les risques sismiques et la vulnérabilité des constructions à ce type de risque. Ce projet devrait permettre de mettre au point une méthodologie qui pourra être appliquée à d'autres régions et pays participant à l'accord.

***Objectifs spécifiques pour 2006 :***

The preliminary study using H/V method indicates that recent alluvial deposits (from the Alzette, Sûre, Moselle and other rivers of Luxembourg), the marls from Lias and clays of Dogger could induce seismic amplification at frequencies ranges from 3 to 7 Hz (see the report of December 2005). In order to better quantify the seismic response of those materials in terms of amplification, it should be envisaged to performed additional analysis.

The seismic hazard analysis in Luxembourg should be then pursued in order to identify zones vulnerable in case of important earthquake around the country (e.g. Belgium, France or Germany).

**RESULTS ATTENDUS EN 2006**

We propose a study in three phases:

*PHASE 1: Seismic response analysis of the geological formations {soft soils} suspected to induce site amplification*

- (a) Additional empirical analysis using ambient noise records focusing on them.
- (b) Compilation of existing geological and geotechnical data to characterize their dynamic physical properties.
- (c) Numerical analysis to estimate their seismic response.

*PHASE 2: Elaboration of seismic scenarios*

- (d) Probabilistic seismic hazard analysis for Luxembourg following the Eurocode8 regulations.
- (e) Definition of the seismic demand for Luxembourg according to the calculated seismic hazard map
- (f) Local seismic hazard analysis using the (a) and (b) results.
- (g) Seismic zoning including site amplification for Luxembourg

*PHASE 3: Analysis of vulnerability for buildings and lifelines*

(h) Identification of vital buildings and lifelines in case of major earthquake.

(i) Vulnerability analysis

(j) Seismic risk analysis and mapping

Each step should include information and education on earthquake at the public and political level.

## RESULTATS EFFECTIFS POUR 2006

The NW-Europe is a zone of moderate seismic activity where large earthquakes could occur in the future (Camelbeeck et al., 1999). The seismic hazard in the Grand Duchy of Luxembourg is not yet defined as recommended by the European regulation Eurocode8. Surrounding countries have already defined seismic zonation for a return period of 475 years based on pre-historical (i.e. paleoseismology), historical and instrumental seismicity. At its border with Luxembourg, the French regulation indicates a Peak Ground Acceleration (PGA) lower than 0.7 m/s<sup>2</sup> (BRGM, 2005), the German one is calculated in terms of intensity and provide a value of V (Grunthal and Bosse, 1996) and the Belgian one gives at the border two zones, a southern one with PGA lower than 0.5 and a northern one with PGA around 0.5 m/s<sup>2</sup> (NAD, 2000).

The strongest earthquake ever known in northwestern Europe occurred near Verviers in September 18, 1692. Its magnitude is estimated close to 6.5 and damages are known in the northern part of Luxembourg (Alexandre et al., 2002). Archives describing the effects of the ground motions in Vianden and Luxembourg were used to give an intensity V value in Luxembourg city. It corresponds to ground motions strongly felt by the population and slight damages to houses and buildings. Several others damaging earthquakes of magnitude greater than 5.5 reported (Alexandre and Vogt, 1994) in Belgium were also, in the past, felt in Luxembourg.

Inhabitants of Luxembourg sometime reports felt ground motions during earthquakes although the seismic activity inside the country is almost null. The Eurocode8 not only recommend a PGA or Intensity to prevent for but also insist on the importance to take into account "site effects" or "site amplification". Indeed, numerous large earthquakes in the world indicated that unconsolidated sediments from ancient lakes, rivers and glacial episodes often amplify ground shaking conducting in important spatial variation of damages in urban areas as most of them are built on such a recent deposits. For this reason, site amplification is the first cause of earthquake damage, more important than the size of the earthquake itself. A notable example of this has been the relatively modest (M=6.6) earthquake which stroke Central Mexico on September 19, 1985. It produced only light damage in the epicentral area, but caused the collapse of 400 buildings and the damage of many more in Mexico City, 240 km from the epicenter. The following investigations showed that Mexico City is built on a sedimentary basin with a proper resonance frequency  $f_0$  of about 1 Hz, corresponding to the resonance frequency of 10 floors buildings, which were the ones most affected by the earthquake. One of the challenges for seismologists is to estimate the resonance frequency  $f_0$  of the unconsolidated deposits and the related amplification to engage further analysis of vulnerability.

Based on the results of the field measurements analysis, four types of sites were distinguished in terms of their empirical seismic response and two of them were recognized as potentially affected by local seismic amplification

1) sites located in marls and clay formations (mainly of Lias and Dogger ages) and

2) sites located in recent alluvial deposits. Those sites could be the place of seismic related amplification for a range of frequencies affecting all types of buildings and infrastructures.

The map delimitates the different zones in Luxembourg where further investigations should be planned to estimate potential seismic amplification due to local geology.

The preliminary analysis of site response with H/V method using seismic ambient noise records helps to define zones suspected to amplify seismic waves in case of important regional earthquakes (in red). (Background : Risques géologiques, Ministère des Travaux Publics, Service Géologique)

The present study (Phase 1 project) is the prolongation of the preliminary study and aims at analyzed the seismic response of the geological formations (soft soils) suspected to induce site amplification.

It includes :

(a) Additional empirical analysis using ambient noise records focusing on them.

(b) Compilation of existing geological and geotechnical data to characterize their dynamic physical properties.

(c) Numerical analysis to estimate their seismic response.

A phase 2 project could be envisaged to produce scenarios by formulating adequate seismic ground motions related to the Eurocode8 regulations. A simple but robust methodology that used in a complementary manner field measurement and computation is explained in the chapter II. A set of tools have been developed that provide a straightforward procedure of calculation and analysis of data.

Its general uses in urban areas is then facilitated and could be reproduce for other urban contexts.

**EVALUATION AND BENCHMARKING OF EXISTING SOFTWARE AND EXCHANGE OF INFORMATION PROCEDURES FOR FORECASTING OF HEALTH AND ENVIRONMENTAL EFFECTS OF INDUSTRIAL ACCIDENTS (*European Centre of Technological Safety, Ukraine*)**

**TARGET COUNTRIES :** All EUR-OPA and EU

**LOCAL COORDINATOR:** TESEC in co-operation with EC

**OTHER PARTICIPANTS :**

**SPECIALIZED CENTRES:** all EUR-OPA Centres from non-EU countries

**COUNTRIES AUTHORITIES:** EUR-OPA members and EU

**OBJECTIVE OF THE PROJECT**

***Global objectives***

The goal of the project is the development of a research programme for the evaluation and benchmarking of existing software and the exchange of information procedures for the forecasting of the health and environmental effects of industrial accidents.

***Specific objectives for 2006***

To coordinate activity with the EC Joint Research Centre.

**EXPECTED RESULTS IN 2006**

To develop a co-operation programme with the EC Joint Research Centre, organize and carry out a joint seminar on this subject.

- Meeting in the EC for the deployment of a co-operation programme to develop a basis of the results of EC projects ETEX (European Tracer EXperiment) and ENSEMBLE (Web-based and user-friendly decision support system for long-range atmospheric dispersion data exchange and model evaluation) joint co-operation programme (date: June 2006)
- EC&TESEC joint seminar on ETEX and ENSEMBLE result implementation in EUR-OPA non-EU countries (date: September 2006)

**ACTUAL RESULTS FOR 2006**

In 1991, a European initiative was launched for increased cooperation and standardisation of atmospheric dispersion models for regulatory purposes. A "new generation" of models is emerging with physically more justifiable parametrisations of dispersion processes. A need was felt for these new models to be developed in a well-organized manner and turned into practical, generally accepted tools fit for the various needs of decision-makers. On this background it was decided to organize a series of workshops to promote the use of new-generation models within atmospheric dispersion modelling, and in general improve "modelling culture". This series of activities has now been going on for about 10 years.

The initiative for increased cooperation and standardisation of atmospheric dispersion models was taken primarily because it was recognised that in Europe, the state of dispersion modelling left much to be desired in several respects :

- There are a great number of regulatory models in use within Europe
- Generally, the models applied were not scientifically up-to-date

There are atmospheric dispersion models of many different types - simple models as well as complex models. In a given situation it may be justified to use a simple model - it all depends on the conditions : a model should be fit for the purpose for which it is applied. Consequently, there are several ways to classify models, such as:

- according to the policy issue they address: industrial pollution, urban air quality, nuclear emergencies, chemical emergencies, climate change, etc.
- according to model concept: Gaussian models, Eulerian models, Lagrangian models, receptor models, etc.

Many EU members have their own air dispersion modeling tool. The process of standardization in the frame of EU is not finished but EUR-OPA, taking into account that the majority of its member states are EU members, has to coordinate his efforts in that area with EC.

During the 11<sup>th</sup> Ministerial Session of the European and Mediterranean Major Hazards Agreement (EUR-OPA), Marrakech, Morocco, on 31<sup>st</sup> October 2006, a meeting has been organized with Ms. Pia BUCELLA (Director for Communication, Legal Affairs and Civil Protection, Directorate General Environment, European Commission) who expressed his interest on the possible co-operation with EC regarding distribution of the best EC experience in air dispersion modeling for EUR-OPA member states.

Seven different candidate models drawn from the [Model Documentation System](#), a searchable database of dispersion models and managed by the European Topic Centre on Air and Climate Change (member of the European Environment Agency framework) can be outlined :

	<i>Field of application</i>
<b>ADMS 3</b>	Air quality assessment, regulatory purposes and compliance for industrial sources, policy support, emergency responses (eg for chemical spills), scientific research.
<b>BUO-FMI</b>	Atmospheric dispersion of gases and particles, emitted from typical fires in warehouses and chemical stores.
<b>DISPERSION21</b>	Mass concentrations of classical air pollutants from industrial or urban sources used in scenario studies to evaluate effects on air quality from existing or planned sources.
<b>EMEP</b>	Dispersion and chemical transformation of air pollutants in the troposphere.
<b>EURAD</b>	Predict air pollution episodes, trends and to study emission reduction scenarios. Therefore, it simulates the transport, chemical transformations and depositions of atmospheric constituents in the troposphere over Europe.
<b>IFDM</b>	Regulatory Modelling; Planning; Environmental Impact Assessment; Evaluating Emission Permit Granting Policy; Optimal Siting of Ambient Air Quality Monitoring Networks; Evaluation alternative sanitation measures (emission reduction strategies), impact of urban traffic planning.
<b>MCCM</b>	Simulation of meteorological variables and transport and chemical transformation of chemical compounds over complex terrain. Real time forecast of weather and air quality, regional climate modeling, regional climate chemistry simulations.

### **1. Atmospheric Dispersion Modelling System 3 (ADMS 3)**

It's a PC based model of dispersion in the atmospheric of passive, buoyant or slightly dense, continuous or finite duration releases from single or multiple sources which may be point, area or line sources. The model uses an up to date parameterisation of the boundary layer structure based on the Monin Obukhov length LMO, and the boundary layer height h. Its principal distinct features are:

- (i) concentration distributions are Gaussian in stable and neutral conditions, but vertical distribution is non-Gaussian in convective conditions to take account of the skewed structure of turbulence vertical component.
- (ii) plume spread depends on the local wind speed and turbulence and thus depends on plume height. This contrasts with Pasquill-Gifford methods where plume spread is independent of height.
- (iii) a meteorological pre-processor which calculates the required boundary layer parameters from a variety of input data: eg wind speed, day time cloud cover or wind speed, surface heat flux and boundary layer height. Meteorological data may be raw, hourly averaged values or statistically analysed data.
- (iv) calculation of averages of mean concentration, deposition and radioactivity, and mean concentration percentiles for averaging times ranging from seconds to a year. For shorter averaging times (1 hour or less) estimates of fluctuations in the concentration, including peaks, are included.
- (v) a number of complex modules allow for the effects of plume rise, complex terrain, buildings, coastlines and the calculation of concentration fluctuations, simple NOx chemistry and radioactive decay.
- (vi) In complex terrain plume impaction and releases into regions of recirculating flow are modelled.

<i>Input</i>	<i>Emissions</i>	Mass of pollutant emitted per second, or total mass for a puff release
	<i>Meteorology</i>	Typical day, time, temperature, wind speed, wind direction, cloud cover or solar radiation, precipitation rate and relative humidity (a time series of up to four years can be used)
	<i>Topography</i>	Terrain height (and optionally surface roughness) entered as a grid of values
	<i>Initial conditions</i>	
	<i>Boundary conditions</i>	
<i>Output</i>		Calculated at the mean plume height : mean concentration of pollutants for averaging times ranging from 10 minutes to 1 year (or more); percentiles of concentration where required; shorter averaging times treated with concentration fluctuation model; dry and wet deposition.

### **2. Dispersion from strongly buoyant sources - Finnish Meteorological Institute (BUO-FMI)**

It addresses the atmospheric dispersion of pollutants emitted from typical fires in warehouses and chemical stores : such fires may represent a major hazard to people and the environment, and the fire plumes may contain a variety of harmful or toxic chemical compounds. It is a local-scale dispersion model applicable for buoyant or passive continuous plumes and based on atmospheric boundary layer scaling theory. The source region and plume rise is modelled according to Martin et al. (1997). After the plume rise, Gaussian equations are used in both the horizontal and vertical directions. After a specified transition distance, gradient transfer theory is applied in the vertical direction, while the horizontal dispersion is still assumed to be Gaussian. The dispersion parameters and eddy diffusivity are modelled in a form, which facilitates the use of a



meteorological pre-processor. We have also presented a new model of the vertical eddy diffusivity, which is a continuous function of the height in the various atmospheric scaling regions. The model also includes a treatment of the dry deposition of gases and particulate matter, but wet deposition has been neglected.

<i>Input</i>	<i>Emissions</i>	Pollutant species, emission rate of released gas and particles, temperature of released gas, mass fraction of released gas, diameter and density of the particles, release height, source diameter and source location
	<i>Meteorology</i>	Monin-Obukhov length, mixing height, surface roughness length, air temperature at ground level, mean wind speed measured at a reference height and wind direction (as an alternative option, the user can input the Pasquill stability class, instead of the Monin-Obukhov length)
	<i>Topography</i>	
	<i>Initial conditions</i>	
	<i>Boundary conditions</i>	
<i>Output</i>		Maximum ground level concentration, plume center-line concentration, advection velocity and deposition flux

### 3. Local Scale Atmospheric Dispersion Model (DISPERSION21)

The model is intended as a PC tool that brings together the results of boundary layer research on dispersion modelling in a code that runs on a Windows PC. An updated dispersion model, based on the Danish OML model, is used for point sources, including effects of plume rise, plume penetration, buildings etc. For line sources, dispersion parameters are related to the gaussian equation using Green functions for analytical line segments. A street canyon dispersion model is used, which includes a chemical scheme for nitrogen oxides. The model also includes a source register and a flexible emission module for traffic sources. Emission factors are calculated as a function of traffic volumes, driving pattern, cold start effects, mean vehicle speed, ambient air temperature etc. for ten different vehicle classes. The system includes a source register for thousands of pollution sources. Meteorological input can be generated either from routine meteorological data, mast data or forecasted weather data. A user-friendly desktop mapping software is integrated with the model to enable presentation of results and analysis of population exposure.

<i>Input</i>	<i>Emissions</i>	Source rates as function of ambient temperature, time of day, week, year and/or in some other periodical variation. Stack dimensions. For traffic sources, emission factors used to calculate emission data using traffic flow or vehicle labour, average speed, scenario year, ...
	<i>Meteorology</i>	The meteorological preprocessor uses surface wind, temperature, humidity, precipitation, cloudiness, radiation, weather and state of the ground together with aerological data for temperature profile, height of temperature inversion, humidity profile, wind profile and cloud data in order to calculate boundary layer parameters, such as mixing layer height, sensible heat flux, net radiation, friction velocity, Obukhov length, buoyancy term, stability class etc. A time series of data from a synoptic station, automatic weather station, mast data or forecasted meteorological data can be used. Wind speed is adapted to the calculation domain using local roughness data.
	<i>Topography</i>	Horizontally homogenous conditions with specified roughness. Slopes should not be steeper than 10%. Varying receptor heights may be used.
	<i>Initial conditions</i>	Different ground types have significant impact on the ground level energy budget. Preprocessing should preferably treat several days of meteorological data in order to reach reasonable surface moisture content.
	<i>Boundary conditions</i>	Rural background concentrations are entered as offset level.
<i>Output</i>		Mass concentrations of examined pollutants. Relative contribution from different sources to mean value. Total emission budget for the period. Descriptive statistics and exceedances. Time series data. Street canyon concentrations in selected streets. Population exposure.

### 4. EMEP Unified Model

The modelling tools previously available were two main Eulerian models, the acidification model (MADE) and the oxidant model (MACHO), and two Lagrangian models, one for acidification and one for photo-oxidants. After years of separate development these models had codes which differed from each other in numerous ways, and even different physical descriptions of processes such as dry deposition and aqueous chemistry. The new unified modelling system has been designed to provide a common core to all MSC-W modelling activities, building upon one Eulerian model structure. In the new system the only differences between acidification and oxidant versions lie in the chemical equations solved, and in associated inputs (i.e. emissions and boundary conditions). The EMEP modelling system allows several options with regard to chemical schemes used, and can include aerosol dynamics. In principle, even if the new modelling system can run any chemistry with relatively little effort, two standard chemistries UNI-ACID and UNI-OZONE, (derived from earlier acidification and oxidant applications of the model) are considered: for current policy runs, the UNI-OZONE chemistry is used as standard. The core subroutines handling physics, meteorology and both the UNI-ACID and UNI-OZONE chemistries are derived from previous EMEP models and have

been subject to extensive testing and may now be regarded as relatively stable. The aerosol dynamics model (UNI-AERO) is comparatively very new to the EMEP model system and the data required to evaluate this model properly are only now becoming available in Europe (for example, emissions inventories to carry information on number density and chemical composition of emissions): it remains mainly a research tool and thus more likely to change in future than the ACID and OZONE model versions.

<i>Input</i>	<i>Emissions</i>	Gridded annual national emissions of sulphur dioxide, nitrogen oxides, ammonia, non-methane volatile organic compounds, carbon monoxide, and particulates. Emissions provided for 10 anthropogenic source-sectors denoted by so-called SNAP codes (an eleventh source-sector exists in the officially-submitted database but consists almost entirely of emissions from natural and biogenic sources). Officially submitted emissions from such sources are not used in the modelling work, except for those from volcanoes.
	<i>Meteorology</i>	3-hourly resolution meteorological data from PARLAM-PS (a dedicated version of the High Resolution Limited Area Model Numerical Weather Prediction model with parallel architecture), archived over many years (currently back to 1980, but not continuously) and produced with a delay of one year after careful check and documentation.
	<i>Topography</i>	Land use data (fractional coverage of different vegetation types over a grid of squares of approx. 50x50 km <sup>2</sup> resolution) required primarily for dry deposition modelling and for estimation of biogenic emissions (sub-grid modelling possible using a so-called mosaic approach - allowing for example ecosystem specific deposition estimates).
	<i>Initial conditions</i>	Initial concentrations of major long-lived species required in order to initialise model runs.
	<i>Boundary conditions</i>	Boundary conditions along the sides of the model domain and at the top of the domain are required as the model is running. It is often need to specify concentrations of some species which are not explicitly included in the chemistry of interest, but that enter into reactions with some of the reacting chemical compounds ('background' species): in UNI-ACID, background concentrations for O <sub>3</sub> , OH, CH <sub>3</sub> COO <sub>2</sub> and H <sub>2</sub> O <sub>2</sub> are used as boundary conditions (BC). The BC values are assumed appropriate for the year 1990 and adjusted for other years using trend factors.
<i>Output</i>		Results for use in Integrated Assessment Modelling (IAM), and for studies on risks and damages caused by pollution. In previous years ozone outputs have consisted largely of so-called AOTx values (typically AOT40, AOT60) based upon the model's predicted grid-average ozone concentrations at 1 m height. New concepts for assessing risks of damage to vegetation have meanwhile been developed and incorporated into the new ICP Mapping Manual. Not only stomatal fluxes, but also the canopy-level concentrations, AOTs, and fluxes are inherently more uncertain than calculations of concentrations at levels such as 3 m above the canopy or of boundary layer averages but potential benefits of calculating ozone close to the canopy (from the effects point of view) outweigh the uncertainties involved.

### 5. European Air Pollution Dispersion Model (EURAD)

It consists of several modules developed at several institutions : main modules are EEM EURAD Emission Module MM5 Meteorological Model Version 5. CTM Chemistry and Transport Model Meteorological data are calculated by MM5 which itself uses initial and boundary conditions from ECMWF-data. The actual CTM uses then the meteorological input (wind, temperature, pressure etc.) and emission inventories from the EEM to predict the dynamic behaviour of air pollutants including aerosols in the model region. The results are analyzed with several tools, e.g. to study fluxes of pollutants, the description of exchange through the pbl or simply to detect concentration trends and levels.

<i>Input</i>	<i>Emissions</i>	NO <sub>x</sub> , VOC, SO <sub>2</sub> , NH <sub>3</sub> , aerosols
	<i>Meteorology</i>	Calculated with MM5 using ECMWF-data. Optional input from LM (Local Model of the German weatherservice DWD)
	<i>Topography</i>	Height, land use
	<i>Initial conditions</i>	ozone either by background or potential vorticity scaling
	<i>Boundary conditions</i>	either background concentrations or coarse grid results in nesting runs
<i>Output</i>		Concentrations (e.g. NO, NO <sub>2</sub> , SO <sub>2</sub> , SO <sub>4</sub> , O <sub>3</sub> , CO, OH, HO <sub>2</sub> , several VOC), Deposition Fluxes, Chemical Fluxes

### 6. Immission Frequency Distribution Model (IFDM)

The IFDM is a bi-Gaussian transport and dispersion model used to assess the impact of emissions from point and area sources up to a distance of 30 km. IFDM has been optimised with respect to computer time requirements, so that it can deal with huge emission inventories and a large number of receptor points with modest computer time requirements. In operational use since 1972, the model has been upgraded continuously and has been validated several times as well for complex urban and industrial regions (Antwerpen, Gent, Tessenderlo), as for the dispersion of tracer gas releases (SF<sub>6</sub>). In 1992, a IBM-compatible PC-version with a simple, yet comprehensive user interface was made available to interested parties on a commercial basis. In 2006, line sources, street canyons and NO-NO<sub>2</sub>-O<sub>3</sub> equilibrium chemistry were added

in order to support new policy demands; this version is called IFDM-POLCA. The output is represented under the form of tables and graphics, allowing immediate analysis and export to other software.

<u>Input</u>	<i>Emissions</i>	<i>Point sources:</i> x,y,stack height & diameter, temperature of gases at stack orifice, volumetric stream and pollutant mass stream plus information on working regimes; <i>Area sources:</i> x,y, diameter (squares), pollutant mass, information of daily cycle, dependency on outside temperature; <i>Line sources:</i> x,y of road end points, pollutant mass, daily cycle <i>Street canyon:</i> as for the OSPM model (Berkowicz)
	<i>Meteorology</i>	Hourly: Month, Day, Hour, wind speed (m/s), direction (degree), rain (mm/h), Bulytnck-Malet stability class if measured; Daily: day-averaged temperature
	<i>Topography</i>	Flat terrain, gently rolling terrain.
	<i>Initial conditions</i>	
	<i>Boundary conditions</i>	
<u>Output</u>		Time series of calculated hourly/daily/monthly concentrations for each receptor statistics: average, maximum and twelve percentiles, including: P50, P70, P90, P95, P98, P998 and P999. Other percentiles are determined by interpolation

*Other input requirements:* Receptor grid, averaging time, dry deposition velocity, wash-out coefficient.

### 7. Mesoscale Climate-Chemistry Model (MCCM)

MCCM is based on the Fifth-Generation NCAR / Penn State Mesoscale Model, MM5 who already includes a multiple-nesting capability, nonhydrostatic dynamics and four-dimensional data assimilation capability as well as many other options for modeling microphysical processes. With exception of the soil model, the meteorological part of MCCM is identical with MM5 3.4. The vertical coordinate of this model is terrain following with the option for high resolution near the earth's surface. It is capable of multiple nesting with up to five subdomains. Any nested subdomain receives time dependent inputs from the corresponding coarser mesh model via its boundaries. Four-dimensional data assimilation of meteorological variables is an option for studies where additional observations such as radiosondes are available over an extended time period. Three separate detailed gas-phase chemistry mechanisms (RADM2, RACM and RACM-MIM) with 61 to 77 chemical species and one aerosol module have been added. In association with the chemistry submodels 22 photolysis frequencies are computed according to cloud cover, ozone and aerosol amounts in the model atmosphere. Biogenic emissions are calculated based on landuse data, surface temperature and radiation. The on-line coupling of meteorology and chemistry provides fully consistent results with no interpolation of data in contrast to off-line coupled chemistry and transport models.

<u>Input</u>	<i>Emissions</i>	Hourly anthropogenic emissions for each grid point. The emissions must be specified for RADM2 species classes
	<i>Meteorology</i>	As MCCM is a coupled meteorology-chemistry model, meteorological input is only needed in the form of initial and boundary conditions
	<i>Topography</i>	Landuse and orography (USGS data delivered by the MM5 preprocessor TERRAIN, which includes global data with resolution of 30 secs, for Euro exists also the option for Corine land use data). Soil type data can be implemented in the model
	<i>Initial conditions</i>	Meteorology: From global model (e.g. MRF, AVN, ECHAM, ECWMF); Chemistry: Starting with homogenous pollutant fields on continental scale or pollutant fields from previous run.
	<i>Boundary conditions</i>	Coarse domain: Meteorology from global model, chemistry fixed (based on observations or typical background values) or outflow dependent; Nested domains: Meteorology and chemistry boundary conditions from mother domain.
<u>Output</u>		Relevant 3-d-meteorological variables; 3-d-fields of pollutants of the RADM2-, RACM-, or RACM-MIM mechanism, respectively; optional aerosol compounds (NH4, SO4, NO3, and organics for fine and accumulation mode); Soil moisture and temperature at 5 layers; biogenic emission fluxes. All output quantities are time dependent with user specified temporal resolution.