

# Synergy and outreach within the European and Mediterranean Major Hazards Agreement (EUR-OPA). Case Study of ECBR - Romania



**E.-S. Georgescu**

*The National Research and Development Institute URBAN-INCERC, and European Center for Buildings Rehabilitation, ECBR, Bucharest, Romania*

## **SUMMARY:**

The large-magnitude Vrancea intermediate depth earthquakes in Romania affect large urban areas and have average interval of decades between destructive events. The damage of buildings in earthquakes of 1940 and 1977, and the interventions after each event, if any, were conditional upon the vulnerability and damage to the next events. ECBR – European Center for Buildings Rehabilitation is a specialised center of EUR-OPA, included in INCERC Branch of the National Institute for Research and Development URBAN-INCERC, since 2001. Romania has public programs of “building rehabilitation”, and the main task of ECBR was to extend the activities beyond engineering issues, aiming to build a culture of prevention, in its relationships with the vulnerability of citizens living in buildings at risk. The paper will present the experience and outreach activities of ECBR and also the synergy to reach objectives of EUR-OPA „MEDIUM TERM PLAN 2011 – 2015 in correlation to ISDR.

*Keywords: buildings rehabilitation, dissemination activities, Romania – ECBR / EUR-OPA*

## **1. INTRODUCTION**

ECBR – European Center for Buildings Rehabilitation is a specialised center included in URBAN-INCERC and is based on a Memorandum of Accession to The European and Mediterranean Major Hazards Agreement (EUR-OPA), adopted by the Romanian Government in 2001. EUR-OPA was created as an open co-operation group by the Committee of Ministers of the Council of Europe in 1987, and it is an appropriate tool to tackle the disaster risk reduction issues. The activities are supported by scientific and technical work developed by the 27 specialised Centers integrated in a network and are correlated with ISDR.

Since 2009, according to the Romanian Government Decision 1398 / 2009, NI for R&D URBAN-INCERC resulted from the merging between INCERC, URBAN-PROIECT and CDCAS, and since 2010 it was a new merging with NCSRR – National Center for Seismic Risk Reduction (a former JICA Project Unit). Presently, ECBR is located in the premises of the National Institute for Research and Development in Constructions, Urbanism and Sustainable Territorial Development URBAN-INCERC, INCERC Bucharest Branch, under specific coordination of Ministry of Regional Development and Tourism - MDRT.

## **2. SYNERGY AND OUTREACH IN ECBR ACTIVITY**

As it is known, the existing building stock in Romania is vulnerable to earthquakes, thus the population and the wealth is at risk. During the last 17 years, several national laws request and support the identification and the strengthening of buildings vulnerable to earthquakes. On the other hand, for the new investments in real estate, many with involvement of companies from less seismic areas, it is necessary a quality assurance that provides safety in case of earthquakes. Earthquake engineering is

only one tool in this respect. ECBR members are conscious that disaster risk reduction is a multi-disciplinary subject and needs a combination of theory and practice. Research is a starting point, and this is performed in URBAN-INCERC, while the transfer of knowledge is done towards the society. Outreach strategies are linked to the institute's mission; ECBR is a small center, but URBAN-INCERC is larger and is able to work with MDRT and other partners.

In seismic zones of Romania, the sustainable development involves rehabilitation of buildings that must be considered in all aspects, therefore, ECBR performed activities based on EUR-OPA documents (AP/CAT 2007-2011), for:

- development and implementation of risk reduction strategy through structural building rehabilitation as a support of a National Program for seismic risk reduction, correlated with Eurocode 8 provisions and buildings and regional and European needs, as well as with those of EUR-OPA Agreement requirements;
- correlation of activities with the development and implementation of research and works in the National Program for thermal and energy rehabilitation of buildings.

The main field of ECBR, as “building rehabilitation” must be considered with due care about its important relationships with the vulnerability of persons that live in buildings at risk, with human habitat in urban and rural environment, with technical codes and laws on related aspects, including socio-economic and ethical aspects. Concerning the task of ECBR, it is important to remark that the situation of buildings rehabilitation in Romania evolved and the situation is as follows:

- there is a contradiction is between the remarkable knowledge about the seismic risk and the attitude of owners of apartments in high-rise vulnerable buildings – they do not cooperate enough for strengthening (Georgescu et al, 2004);
- since adoption of the Law O. G. 20 /1994 there are steps of decisions with a chain of communication to the owners, these must be treated with other tools than purely administrative ones;
- it is obvious that formal legal aspects of bidding, contracting and surveying are a source of delays.
- some owners are afraid of apartment mortgaging, many are rather old, low-income, absentees or just do not want to be disturbed by evacuation and noisy works;
- some owners and even some lawyers and court judges were confused in their decisions concerning the balance between private property apartments inviolability and risk reduction needs in condominiums;
- since 2003, the concerned ministry (currently named MDRT) promoted improvements of the Law OG 20/1994, as buildings that represent a first class of risk with criteria of public danger and require compulsory strengthening were to be subjected to urgent City Mayor Decision. This may become a Court ruling against bad-will owners who obstruct strengthening works. Other legal penalties are addressed to employees and/or owners for delay of decisions, or deadlines of 2 years for design and 2 years for works. But the pace of works is still too slow.
- mass-media showed a contradictory behaviour. They wrote papers with a lot of criticism to authorities and sometimes to engineers for the slow pace of rehabilitation, but on the other hand they published numerous unreliable seismic predictions, that are misleading for citizens' behavior.

There is a need of synergy between research, education and implementation. Synergy in terms of management and in relation to team working refers to the combined effort of individuals as participants of the team, with interactions able to produce a joint effect that is greater than the sum of the parts working alone. There is also a need to consider transboundary impacts of Vrancea and relationships with EUR-OPA centers from neighboring countries.

Outreach is an effort by individuals in an organization or group to connect its ideas or practices to the efforts of other organizations, groups, specific audiences or the general public; it is a systematic attempt to provide services beyond conventional limits, as to particular segments of a community. In the field of risk reduction, outreach often takes on an educational component (i.e., the dissemination of knowledge about buildings performance), but an outreach strategy must have also a feed-back from

citizens and authorities. Thus ECBR is capturing signals from society and gives answers for risk reduction.

Specifically, ECBR activities ensured some studies on identification of compound risks caused on long-term by climate changes and earthquakes to buildings, needs and means of rehabilitation and also support and dissemination of knowledge for earthquake rehabilitation of buildings:

- activities for citizens in view of new legal measures to enforce the antiseismic rehabilitation of first class of risk high-rise buildings by special labelling;
- presentations of earthquake preparedness rules for school students, using INCERC booklets and multimedia;
- contribution to the information website on seismic risk in Romania

### **3. ECBR ACTIVITIES IN 2007-2011**

The activities for citizens to enforce the antiseismic rehabilitation took into account the situation of buildings at risk and rehabilitation and recent developments. The strengthening involves partial or total evacuation of apartments and the works involve living disturbances. Many owners hesitate to engage in loans with long-term mortgage for strengthening, although financial incentives exist. Since the risk reduction rate is low, the most critical issue is to increase the number of retrofitted buildings.

In 2007 ECBR held seminars with citizens and officials in City Hall sector 2, Bucharest and released printed matter for citizens under preparation to include last legal changes. School students represent a specific audience target for earthquake education that was considered together with the JICA project where Japan and Romania put together their best knowledge, and many seminars were organized. A good example of knowledge dissemination program in schools, for earthquake education, is in partnership of MDRT / MTCT-INCERC with Ministry of Education and Research - MEdC, Ministry of Administration and Interior-MAI and NCSRR-JICA Experts. The seminars used color booklets and associated color posters for schools, on 3 categories of age, drafted together, and the project was highly appreciated in the 1-st ECEES-First European Conference on Earthquake Engineering and Seismology, Geneva, Switzerland, September 2006 (Georgescu et al, 2006). This cooperation led to a closer cooperation among technical experts, citizens and educators.

The information website on seismic risk in Romania INFORISX is viewed as a direct approach in disseminating information concerning seismic risk in Romania (Craifaleanu et al, 2011). Data is structured according to the estimated profile of the visitors of the site: citizens, mass media, construction professionals, researchers, managers of commercial, medical, cultural and social organizations, organizations and personnel in charge with seismic risk mitigation etc. ECBR staff ensured that the website provides basic knowledge about the seismicity of Romania and relevant facts and figures concerning past earthquakes which affected the country, about actions and conduct to be taken during strong earthquakes and after such catastrophic events. Another section includes data on Romanian seismic networks, including station data, processed seismic data and relevant diagrams.

In 2007 the Director of ECBR attended in Italy the International Seminar of the STEP Project on post-earthquake investigation with the presentation referred to: „Romanian Methodology for post-earthquake inspection of buildings and provisional measures for safety”.

Keeping alive the memory of past disasters is a very effective tool. Thus, ECBR participated to the Symposiums:

- “Thirty Years from the Romania Earthquake of March 4, 1977”, Bucharest, Romania, 1-3 March 2007, UTCB (Georgescu and Pomonis, 2007);
- International Symposium on Seismic Risk Reduction. The JICA Technical Cooperation Project in Romania, 26-27 April 2007, Romanian Academy, Bucharest;

- European and Mediterranean Workshop on Disaster Reduction at School, Building safer schools communities, Paphos, Cyprus, 29-30 October 2007, presenting „Earthquake education of school students, teaching and administrative staff in Romania (Georgescu, 2007).

In 2008, ECBR started preparatives for a coordinated program for activities at European scale on seismic risk management, considering the role of developers and house builders as creators of territorial development, the need of sustainable constructions in member countries, especially of those recently becoming members of the European Union. A draft of programme of activities on seismic risk management, enhancing a number of preventive measures was included on Agenda of UEPC-European Union of Developers and House Builders and the Romanian Federation of Ownership in Construction - PSC, and it was discussed in the meeting held in Bucharest in October 23, 2008.

In 2008, the support and dissemination of knowledge for earthquake rehabilitation of buildings for citizens included:

- seminars of dissemination of earthquake preparedness knowledge for students of 6 schools in Bucharest, using 4 types of INCERC booklets and multimedia, using also Japanese didactic seismic simulators of the NCSRR- The National Center for Seismic Risk Reduction – JICA Project in Romania, in collaboration with Romanian Red Cross and Institute for Sciences of Education;
- Workshop with participation of university professors and students, aimed to the dissemination of seismic risk reduction projects and activities at INCERC-ECBR, in September 2008;
- media coverage and activities for citizens to support new legal measures to enforce the antiseismic rehabilitation of first class of risk high-rise buildings by special labelling;
- ECBR contributed to the maintenance of INCERC Information website section on seismic risk in Romania – INFORISX;
- ECBR Director presented 7 university courses on building vulnerability, seismic risk and population preparedness for earthquakes, for students of the 5-th grade in urban engineering, at Technical University of Civil Engineering of Bucharest, in November and December 2008;

Participation to Conferences included:

- presentation of a posters and papers of ECBR – INCERC for the 14-th World Conference on Earthquake Engineering, Beijing, China, October 2008 (Georgescu et al, 2008);
- conferences for Romanian Civil Protection staff, concerning earthquake vulnerability and disaster prevention;

ECBR participation to other International, Regional and European Projects included:

- technical and applicative meetings on buildings inspections after earthquakes in the framework of STEP Project in Italy and Slovenia;
- International Workshop on Seismic Hazard and Seismic Risk Reduction in the Countries Influenced by Vrancea Earthquakes, NATO Sfp 980468, Chisinau, R. Moldova, 19 – 20 mai 2008, [igg.asm.md/sfp/index.html/](http://igg.asm.md/sfp/index.html/).
- ESC 2008: 31<sup>st</sup> General Assembly of the European Seismological Commission), Hersonissos, Creta, Grecia, 7-12 September 2008, [www.esc2008.org](http://www.esc2008.org).
- SSCR 2008, First International Conference on Seismic Safety Problems of Caucasus Region Population, Cities and Settlements), [www.ismee.ge/sscr2008/](http://www.ismee.ge/sscr2008/) , Tbilisi, Georgia, September 8-11, 2008.

Since 2009, ECBR started a plan for 2009-2011, but correlated to the OPA Medium Term Plan 2011-2015. Specific results in 2009 were:

- a broader dissemination, including target audience of foreigners that are living in seismic zones of Romania;
- Seminars for providing knowledge and informing people, States, Institutions about the means and ways of earthquake preparedness and disaster prevention held in 2 Universities, C. I. Parhon Medical Research Institute in Bucharest and The High School Emil Racovita, Bucharest;

- Participation of ECBR with Association of Building Developers - PSC Romania in the UEPC-European Union of Developers and House Builders PROGRAMME ON SEISMIC RISK MANAGEMENT, aimed at the formation of a strategy and a coordinated program of actions to reduce earthquake risk in Europe, PSC, Bucharest, Romania, introducing an educational tool on PSC INTERNET Site - English section with topics as “Seismicity of Romania and past earthquake effects” Thus, the foreign contractors and staff working in Romania, design architects, engineers, engineers, foremen, skilled workers and craftsmen of building sites will be informed by PSC about this initiative. Associated activities in 2009 were correlated with other dissemination programs of INCERC and NCSRR (JICA Project).

Other achievements in 2009 were:

- presentation on „Sichuan-Wenchuan Earthquake, China 2008. Lessons on public strategies for disaster management”, February 25, 2009, Workshop of General Inspectorate for Emergency Situations, at Snagov, Romania;
- presentation on Post-Earthquake Buildings Investigation Needs in view of Requirements and Trends of the European Union, Workshop for Day of Civil Protection, February 26 2009, Inspectorate for Emergency Situations, Bucharest, Romania;
- participation to the drafting of the Romanian Government Decision for National Platform on Reducing the Disaster Risk, with IGSU - Romanian Inspectorate for Emergency Situations, i.e. Civil Protection;
- presentation on «Reducing Disaster Potentials in case of earthquakes in Romania, in the framework of requirements of EU and UN-ISDR Platform », The International Day of Natural Disasters Risk Reduction, IGSU, Calimanesti, Valcea, 14-15 October 2009.

In 2010, members of ECBR ensured consulting for design engineers related to enforcement of the new Romanian Code for the seismic rehabilitation of existing buildings, correlated with the enforcement, starting with 2010, of Part 3 of Eurocode 8 , participation of ECBR Director in TV Antena 3 technical debate on earthquake strengthening of buildings (March 2010); presentation of a paper and key-lecture on „Building Damage in Chile Earthquake of February 27, 2010 and Lessons for Romania”, National Conference of Romanian Association of Structural Design Engineers – AICPS, May 28, 2010.

Also ECBR held Seminars for providing knowledge to students of Interior Design Department in University of Architecture and Urbanism „Ion Mincu” Bucharest, on „Hazard, vulnerability and seismic risk in Romania”, „Learning from Earthquake Disasters”, „Earthquake of LAquila, Italy of April 6, 2009, damage on buildings and nonstructural members”. (October 21, 28 and November 4, 2010).

Specific achievements in 2010 were:

- presentations in University of Architecture and Urbanism „Ion Mincu” Bucharest, Master course „Sustainable development – the integrated concept of built space”, on topics as: „Evaluation of natural and man-made risks. Strategies for risk reduction in exposed zones”. (A number of 5 conferences - October-December 2010);
- presentation on LAquila 2009, Italy and Maule-Chile 2010 earthquakes. Lessons on public strategies for disaster management, February 25, 2010, PROTCIV 2010 Workshop of General Inspectorate for Emergency Situations, at Snagov, Romania;
- members of ECBR made presentations on Maule-Chile 2010 Earthquake Buildings Damage, CNCISC Conference September 24, 2010, Bucharest.

A special issue is related to conferences with the subject: “Seismic hazard and vulnerability of buildings in Romania. Implications on application of the Law on compulsory insurance system for earthquakes, landslides and floods for dwellings.” related to the introduction of the new compulsory insurance system for earthquakes, landslides and floods for dwellings, with the National Insurance Survey Commission - CSA - the National Pool of Insurance:

- the seminar “How it is going to work the compulsory system of insurance ?” organized by ZIARUL FINANCIAR, Hotel Howard Johnson Grand Plaza, Bucharest, September, 16, 2010.

- seminar "Compulsory insurance of dwellings: a necessity with social character", Timisoara, 20 mai 2010;
- seminar „Compulsory insurance for dwellings”, Constanta, June 24, 2010.

A presentation on «The Vrancea Earthquake of November 10, 1940 : Recovery of some historical data on impact on buildings and people », Commemorative Symposium 70 years since the November 10, 1940 Earthquake, E.S. Georgescu and A. Pomonis (Greece), University of Civil Engineering - UTCB, November 10, 2010, Bucharest. The correlation with the EPBD-European Performance of Building Directive is achieved through some parallel activities of devoted researchers of INCERC Bucharest Branch.

ECBR staff presented 4 conferences about the seismic disasters in New Zealand 2010 and 2011, as well as about Japan Off-Tohoku disaster 2011, for the staff of General Inspectorate of Emergency Situations, AICPS-Association of Structural Design Engineers and at the Ministerial Committee for emergency Situations of MDRT - Ministry of Regional Development and Tourism.

#### **4. FUTURE ACTIVITIES OF ECBR**

The ECBR members in URBAN-INCERC will address in a synergy manner during the next period the priorities of the OPA Document AP/CAT (2010) 05 rev.2 Or. E. : „MEDIUM TERM PLAN 2011 – 2015 Working together in Europe and the Mediterranean for the prevention of disasters, preparedness and response” adopted at the 12th Ministerial Session of the European and Mediterranean Major Hazards Agreement (EUR-OPA), Saint Petersburg, Russian Federation, 28 September 2010, that are as follows:

I - Focusing on preparedness for emergencies: using information to save lives and help victims.

The ECBR has favourable premises to the following OPA specific priorities:

- using information to assess the magnitude of events, to alert the population and to promote communication between governments during emergencies – mainly through earthquake education means for early warning use, when the public pager system would be available;
- promoting disaster medicine and psycho-social preparedness – by evaluation of correlation between the buildings vulnerability patterns and casualty patterns, possibilities of reducing human vulnerability, starting from recent studies and dissemination to Civil Defense and medical doctors.

II - Using knowledge to reduce vulnerability

The ECBR may address gradually the following OPA specific priorities:

- promoting research and use of knowledge in disaster risk reduction – within current Romanian and European Research Programs
- evaluating and mapping risk and using information in spatial planning – within MDRT programs
- using knowledge to train specialists – within cooperation with universities and professional associations for earthquake engineering and disaster reduction.

III - Placing people at the heart of disaster risk reduction: improving prevention and preparedness and promoting good governance. In this respect, having in mind the legal duties of MDRT, and of URBAN-INCERC and ECBR as part of it, the Center has premises to address gradually and contribute to the OPA specific priorities for earthquakes and landslides:

- promoting efficient disaster risk reduction policies – within URBAN-INCERC and ECBR relationships with MDRT and IGSU – General Inspectorate of Emergency Situations;
- improving governance of disaster risk reduction - within URBAN-INCERC and ECBR relationships with MDRT and IGSU;
- improving resilience and preparedness through education and awareness – within ECBR activities
- taking care of ethical aspects – within cooperation with other institutions, NGO and professional associations

A project of ECBR for 2012-2013 has the subject „Earthquake preparedness of school students and population using scientific knowledge for public multimedia information in areas shaken by Vrancea, Romania, intermediate seismogenic source. Case studies of specific vulnerability and damage in Romania and transboundary impacts on buildings in R. Moldova, Ukraine and Bulgaria”. Objectives of the project are dissemination of earthquake preparedness knowledge for school students and population using public multimedia information in areas shaken by Vrancea, Romania, intermediate seismogenic source. As deliverables, there are Web site materials and leaflets: “How to be prepared for Vrancea earthquakes” (in English and in official languages of Romania, R. Moldova, Ukraine and Bulgaria).

They will draft the materials for each country and they will be made available on the ECBR site, as well as on the site of each center, in English and in the official languages of each country. A seminar with representatives of authorities and mass-media will be held. The activity/project contributes to further synergies among the specialized centers in the network of the Agreement - in this case EUR-OPA Centers from Romania, R. Moldova, Ukraine and Bulgaria and also other centers.

## **5. CONCLUSIONS ON THE SYNERGY AND OUTREACH OF ECBR ACTIVITY**

ECBR is concerned with the connection that was made between the vulnerability of buildings and the need to rehabilitate them, overpassing the gaps of peoples risk perception, administrative shortcomings and slow pace of strengthening works in Bucharest. The recognized quality and number of activities for earthquake education of school students and citizens, that must overcome the negative impact of mass-media coverage with catastrophic content.

ECBR increased the training and dissemination activities in Master Courses in two prestigious universities of Bucharest, while the visibility of ECBR in national, european and international activities is increasing.

Therefore, long-term and medium-term synergy and outreach of ECBR activities proved good results and they are developing in a comprehensive way:

- between engineering and other sciences;
- between ECBR authorities, institutions and media;
- with other persons and groups that are a subject and/or partners in seismic risk reduction;
- with EUR-OPA partner Centers and with neighbouring countries;
- with JICA and other international agencies.

The researchers of URBAN-INCERC / ECBR contributed to very important codes for evaluation and rehabilitation of buildings, as well as manuals for earthquake education during last years. It is important that the present field of research of URBAN-INCERC can provide for a more interdisciplinary approach of disaster risk reduction, at building and urban fabric scale, in correlation with sustainable development.

## **ACKNOWLEDGEMENT**

The author acknowledge the financial support of The European and Mediterranean Major Hazards Agreement (EUR-OPA) for ECBR and participation in outreach activities within IAEE and EAEE.

## **REFERENCES**

AP/CAT(2011)12. Or. E. European and Mediterranean Major Hazards Agreement (EUR-OPA) Meeting of the directors of specialised centers, 3-4 February 2011. Council of Europe Office, PARIS. CONCLUSIONS. [www.coe.int/euoparisks](http://www.coe.int/euoparisks). Strasbourg, Strasbourg, 4 March 2011.

- AP/CAT (2010) 03 Or. E. European and Mediterranean Major Hazards Agreement (EUR-OPA) Meeting of the directors of specialised centers, 1-3 February 2010. Council of Europe Office, PARIS. CONCLUSIONS. [www.coe.int/euoparisks](http://www.coe.int/euoparisks). Strasbourg, 18 March 2010.
- AP/CAT (2010) 05 rev.2. Or. E. European and Mediterranean Major Hazards Agreement (EUR-OPA). MEDIUM TERM PLAN 2011 – 2015. Working together in Europe and the Mediterranean for the prevention of disasters, preparedness and response, adopted at the 12th Ministerial Session of the European and Mediterranean Major Hazards Agreement (EUR-OPA), Saint Petersburg, Russian Federation, 28 September 2010.
- Craifaleanu, I.G., Georgescu, E. S., Borcia, I. S., Aldea, A., Vacareanu, R., Arion, C. (2011): INFORISX: Information Website on the Seismic Risk in Romania. *Proceedings of TIEMS 2011 - The International Emergency Management Society, The 18-th Annual Conference*, Bucharest, Romania, 2011.
- Georgescu, E. S.: Earthquake Education of School Students, Teaching and Administrative Staff in Romania. *EUR-OPA Major Hazards Agreement Euro-Mediterranean Workshop on Disaster Reduction at School, "Building safer school communities"*, Paphos, Cyprus, 2007.
- Georgescu, E. S. and Pomonis, A. (2007): The Romanian earthquake of March 4, 1977: new insights in terms of territorial, economic and social impacts. *Proceedings of the International Symposium on Strong Vrancea Earthquakes and Risk Mitigation*", October 4-6, 2007, International Conference. Center of the Parliament of Romania, Bucharest. Symposium jointly organized by the UTCB Bucharest and the CRC 461 University of Karlsruhe, Germany.
- Georgescu, E. S. and Pomonis, A. (2008). The Romanian Earthquake of March 4, 1977 Revisited: New Insights into its Territorial, Economic and Social Impacts and their Bearing on the Preparedness for the Future. *Proceedings of the 14th World Conference on Earthquake Engineering*, October 12-17, 2008, Beijing, China.
- Georgescu E. S., Tojo, I., Stamatiade C. P., Iftimescu R., Vladescu C., Negulescu C., Radoi R. (2004): Japan - Romania knowledge transfer for earthquake disaster prevention preparedness of citizens in Bucharest, *Proceedings of the 13-th World Conference on Earthquake Engineering*, August 1st-6-th, 2004, Vancouver, British Columbia, Canada.
- Georgescu E. S., Kaminosono T., Miyara K., Ghica R., Stamatiade C. P., Ionescu G. (2006): Earthquake preparedness in Romania and knowledge dissemination in a JICA project on seismic risk reduction. *Proceedings of the 13-th European Conference on Earthquake Engineering*, and *The 1-st ECEES - First European Conference on Earthquake Engineering and Seismology* Geneva, Switzerland, 2006.
- Georgescu E. S., Kato H., Miyara K., Stamatiade C. P., Ionescu G. (2008): Seismic risk perception vs. seismic risk reduction. Results of a JICA Project in Romania. *Proceedings of the 14-th World Conference on Earthquake Engineering*, October 12-17, 2008, Beijing, China.