

	<p style="text-align: center;"><i>Crna Gora</i> SEIZMOLOŠKI ZAVOD</p> <p style="text-align: center;">81000 Podgorica, R. Burića 2 Crna Gora, p. fah. 196 Tel. (382) (81) 648-146, 609-000, faks: 648-146 e-mail: seismocg@cg.yu</p>  <p style="text-align: center;"><i>Montenegro</i> SEISMOLOGICAL OBSERVATORY</p> <p style="text-align: center;">81000 Podgorica, R. Burića 2 Montenegro, P.O.Box. 196 Tel. (382) (81) 648-146, 609-000, fax: 648-146 http:// www.seismo.cg.yu</p>
<p>NATO North Atlantic Treaty Organization</p> <p>SCIENCE FOR PEACE AND SECURITY PROGRAMME</p> <p>Public Diplomacy Division</p>	<p style="text-align: center;">Montenegro Seismological Observatory Podgorica</p>
<p style="text-align: center;">WORKSHOP OF NATO Sfp983054 Project</p> <p style="text-align: center;">"Harmonization of Seismic Hazard Maps for the Western Balkan Countries"</p> <p style="text-align: center;">Bečići, Budva, Montenegro</p> <p style="text-align: center;">16 – 17 December 2008</p>	

MINUTES OF THE FORTH WORKSHOP

Discussion and Conclusions

NATO SCIENCE FOR PEACE PROJECT NO. 983054 (BSHAP)

"Harmonization of Seismic Hazard Maps for the Western Balkan Countries"

Bečići, Budva, Montenegro

16 . 17 December 2008

The fourth Workshop of the Project '*Harmonization of Seismic Hazard Maps for the Western Balkan Countries*' was organized by Montenegro Seismological Observatory with participation of representatives of the partner institutions from countries involved in the Project: Albania, Bosnia and Herzegovina, Croatia, Macedonia, Serbia and Montenegro, and NPD Prof Sinan Akkar from Turkey.

As the host, Prof Branislav Glavatovic, PPD, formally opened the Workshop. He welcomed colleagues to Montenegro wishing them a successful work and also welcomed the new members of the Albanian team that will work on the Project realization: newly appointed Co-Director, Prof Ismail Hoxha, Director of the Institute of Geosciences of the Polytechnic University of Tirana, as well as team members Prof Llambro Duni and Prof. Neki Kuka.

FIRST DAY SESSIONS:

First session of the Workshop was dedicated to analysis of activities undertaken during the first year of the Project realization, as well as to the resolution of the next steps that should be taken.

Ms Jadranka Mihaljevic, the team member from MSO, made a short presentation about the current status in the Project progress as described in the last Project *October Report* to NATO Sfp Office. The Overview of Achievements since the Start of the Project until present time was given, as well as the Milestones for the Next Six Months. Also, the consumption of the separate budget items was analyzed. Recommendations and feed back information from the Sfp Office were emphasized.

As the part of summary of recent activities, Prof Sinan Akkar, NPD, reported about the communication with the selected instrument vendors, related to the current state and perspectives of instrument delivery.

Ms Radmila Salic, on behalf of IZIIS, delivered the letter addressed to Prof Akkar as the Project NPD, signed by Prof. Zoran Milutinovic and Prof Mihail Garevski. The letter is considered as the part of this Minute and is the formal reaction of IZIIS on Guralps failure to keep delivery terms. Since Prof. Akkar was already informed about the content of the letter itself, there was no further discussion on this issue.

Prof. Branislav Glavatovic, PPD, made a short list of activities that should be realized in the coming period of time with the accent put on the order of priorities:

- o Completion of the earthquake catalogue,
- o Delineation and characterization of seismic faults,
- o GIS Software purchase and training,
- o Selection of optimal ground motion prediction model,
- o OHAZ Software finalizing,
- o EZ-FRISK Software or similar purchasing and
- o Applying alternative software for PSHA in several limited areas with fully described seismotectonics and comparison of obtained results.

In respect to overview of already achieved results, Prof. Marijan Herak elaborated the current state of the compilation of the national earthquake catalogues. The missing catalogue from Serbia was delivered just before the Meeting. The preliminary results of de-clustering and completeness investigation imposed to this catalogue (in the same methodology as used to other catalogues previously) shows the inconsistency in de-clustering. Also, the threshold magnitude of 3.6 is significantly higher than in other national catalogues. The conclusion is that the provided catalogue, in such a form, is not consistent with the earlier reached agreement and it practically cannot be used for the seismic hazard assessment.

The earthquake events are represented by local magnitude type as it was agreed before. The ways to convert this type of magnitude into more useful (from the stand point of recent ground motion prediction models) moment magnitude was discussed. The supplement to this discussion . a scientific paper (*Empirical global relations converting MS and mb to moment magnitude*, E.M. Scordilis, *Journal of Seismology* (2006) 10: 225–236) related to this question will be available, under the *Downloads*, on the Project Web page.

The second session was devoted to Ground motion predictive models. Prof Sinan Akkar presented the evaluation of recently derived prediction models using Turkish accelerometric database. The intensive discussion on suitability of so called - global predictive model followed. Having in mind the specific needs of Project, the suggestion was made to open the existing strong motion record data bases freely for exchange or to gather it and put it on the Project Web.

The third part of the morning work was devoted to the preparations for the GIS implementation. Mr. Branko Dragicevic made presentation about the GIS, objectives of introducing geographic information system, its main components, etc. With respect of to Project specific needs he compared main characteristics of available software on the market. Discussion on the subject of choice of geographic projection to be used in the Project ended with the conclusion that the optimal solution is the WGS-84, Universal Transverse Mercator projection. Also, Mr. Dragicevic repeated the willingness of Seismological Survey of Serbia to organize the GIS training on a number of topics as will be agreed.

The fourth topic of the Workshop-day one was gathering information on seismotectonic in the region. Prof Glavatovic suggested and presented the form of characterization of seismotectonical faults as was described in the *UNIFIED METHODOLOGY AND LEGEND*

FOR SEISMOTECTONICAL FAULTS CHARACTERIZATION of the Project "ADRIA COST Action 625". Also, Prof Herak reported about the convenient and very useful possibility to get some of the final results of this project by the end of the spring of next year. It is obvious that the amount of precise data about the position, recent tectonic activity and type of seismogenic faults in the region are not sufficient. Still, some preliminary integration of data must provide starting information so to prepare the plan for further activities.

SECOND DAY SESSIONS:

First session of the Workshop-day two was committed to the questions of choice and implementation of Software to perform the PSHA.

First, Prof Neki Kuka of the Institute of Geosciences, Tirana, made overview of the methodology and Software used for seismic hazard assessment including mathematical background, general methodology, practical implementation and available software.

Later on, Prof Llambro Duni presented the investigation of Albanian team related to conversion of different magnitude scales into moment magnitude. The investigation was performed under the available earthquake catalogues data from Albania, Montenegro, Macedonia and Greece - Thessaloniki.

As agreed in advance, the Multilateral Protocol on further developing the OHAZ software between MSO (as the representative of the SfP Project No 983054), Institute of Geosciences of Polytechnic University of Tirana and Environmental Agency of Republic of Slovenia (ARSO) was presented and signed by present parties. The Protocol will be sent to Ljubljana, Slovenia to be signed by Dr. Silvo žlebir, Director General of ARSO. With this protocol the possibility is opened to further develop the OHAZ software with the consent of all parties that were involved in its development.

Second session was thematic presentation of the user-friendly software for data processing and spectral analysis of accelerograms. Prof. Sinan Akkar made an introduction into Utility Software for data processing (USDP). The software is free for downloading, with the available help menu.

Finally, at the end of Meeting the next activities and tasks were discussed and concluded as follows:

Activities and Responsibilities – Conclusions

AC 1: Overview of current project status

1. To realize the training of young scientists in cooperation with INGV or some other similar institution. As the appropriate form of training the suggestion is given to invite experts and perform training for a number of young scientists from participating institutions.
2. In relation to this task Co-directors should provide list of interested researchers, foreseen trainers, subject of training, as well as all other suggestions
(*TERM: midst of January 2009.*)
3. To undertake further efforts to provide additional funding for the Project realization.

AC 2: Delivery of instruments

1. To accept the date of January 11th as delivery term for the complete Guralp purchased seismic equipment.
 2. At the time, estimated time for the GEOTECH delivery is not sooner than March 2009. Conclusion is to ask SfP NATO office for the issuing the formal letter to GEOTECH urging the delivery. More over in direct communication with SfP NATO office the suggestion was made to prepare this letter and issue it to Mr. Walter Kaffenberger.
 3. To issue a letter with the statement of purpose of importing of instruments . for the tax and custom exoneration (according to Annexes 9 and 10 of Project Management Handbook).
- TERMS: beginning of January*

AC3: Earthquake catalogue completion

1. To ask for the confirmation of Serbia to provide more detailed catalogue (threshold M 3.0) and the precise term of delivery. Also, to provide description on de-clustering method implemented,
2. To improve the catalogue from Bosnia and Herzegovina,
3. To provide updated Albanian and Montenegrin catalogue (last years),
4. Paper about the magnitudes conversion to be put on BSHAP Web,
5. To elaborate existing national formulas on magnitude definition and to send the reports to Prof. Marijan Herak.

AC3: Ground motion prediction models

1. To try to gather the strong motion record data base and put it on the Project Web,
 2. To urge Macedonian partner to make further compatibility analysis of existing records according to state of the art of PGM models.
- TERMS: end of January 2009*

AC4: GIS implementation

1. WGS-84, Universal Transverse Mercator to be implemented as the basic geographic projection,
 2. Map Info is suitable software for the project needs,
 3. GIS training to be organized in Belgrade - March
 4. Number of participants and the level of training to be reported
 5. To implement some of the thematic GIS layers as training procedure
- TERMS: February 2009*

AC5: Seismic source zone delineation and characterization

1. All available data to be formatted according to presented methodology and collected in MSO
- TERM: as soon as possible the preliminary report - final term end of March*

AC6: Development of OHAZ

1. Protocol to be signed
2. To get introduced to program source code and try to further develop it especially in respect to:
 - o PGM form
 - o Dynamic memory
 - o Further Help development
3. To publish software executive code on the Project BSHAP web page.