

	
<p>NATO North Atlantic Treaty Organization SCIENCE FOR PEACE AND SECURITY PROGRAMME Public Diplomacy Division</p>	<p>International Conference on Earthquake Engineering "Banja Luka Earthquake - 40 years of Construction Experience"</p>
<p align="center"><b>WORKSHOP OF NATO Sfp983054 Project</b>  <b>"Harmonization of Seismic Hazard Maps for the Western Balkan Countries"</b>  <b>Banja Luka, Bosnia and Herzegovina</b>  <b>26 – 27 October 2009</b></p>	

**MINUTES OF THE FIFTH WORKSHOP**  
**NATO SCIENCE FOR PEACE PROJECT NO. 983054 (BSHAP)**  
**"Harmonization of Seismic Hazard Maps for the Western Balkan Countries"**

*Banja Luka, Bosnia and Herzegovina*  
*26 – 27 October 2009*

On the occasion of International Conference on Earthquake Engineering "Banja Luka Earthquake - 40 years of Construction Experience" in Banja Luka, Bosnia and Herzegovina, the fifth Workshop of the Project "Harmonization of Seismic Hazard Maps for the Western Balkan Countries" was organized, in cooperation with Conference Committee, by Montenegro Seismological Observatory (MSO). The participants from all partner institutions (Albania, Bosnia and Herzegovina, Croatia, Macedonia, Serbia and Montenegro, and NPD Prof. Sinan Akkar from Turkey) were present.

**FIRST DAY SESSIONS:**

Prof. Branislav Glavatovic, PPD, formally opened the Workshop.

**The current Project progress as described in the last Project October 2009 Report** was presented by Ms Jadranka Mihaljevic, the team member from MSO. The Overview of Achievements since the start of the Project until present time was given, the consumption of the National budget items was analyzed, as well as some reported administrative difficulties. The conclusions of debate are as follows:

- The NPD will issue to Albania Custom Office the Tax Exemption Letter.
- The instruments purchased from Geotech Instruments Ltd. For Bosnia and Herzegovina are still not deployed, and are still under testing. The testing of MSO purchased instruments from the same company showed high level of long-period instrumental noise. The repairing process of the instruments by the vendor is ongoing. With respect to prolonged deployment of seismic instruments Prof. Akkar suggested the possible request for the extending of Project duration for a half of year, what should be considered.
- The purchase of EZFRISK as the software for seismic hazard assessment, as the comparable one to the OHAZ software, should be realized soon.

**Regional Unified Earthquake Catalogue** in the final form, was prepared and presented by Prof. Marijan Herak, Croatia. The Catalogue has been compiled on the base of available catalogues of referent agencies as well as delivered national catalogues of Project participating countries.

- The final results of previously presented and approved procedures for catalogue data validity and compilation, declustering procedure and multiples removal are adopted.
- Prof. Herak offered his help on further analysis in the case of any new catalogue data would be available. In the meantime, the current state of the Catalogue may be considered as the finalization of working package.
- The agreement was made to keep Catalogue data expressed in terms of local magnitude. For the PSHA computation the additional magnitude transformation will be performed, but will not be included as a new Catalogue version, but as an option in the OHAZ software. In this way the future compiling and use of this BSHAP Catalogue will point to original data.
- The terms of BSHAP Catalogue data usage are agreed on Skopje Meeting (see Minutes of Skopje Workshop, 17-18 December 2007, as well as in Project Protocol on data exchange between all the Project participating institutions.

**Activities on seismotectonic study in Serbia - overview of relevant data.**

Serbia Project Co-director Ms. Svetlana Kovacevic from Seismological Survey of Serbia, presented recent activities on available data collection on seismotectonics for the territory of Republic of Serbia. The principal approach of investigation and the GIS map of seismically active faults in Serbia were presented.

- Integration of all national data on seismotectonics should be over until the end of February 2010. For the collection and integration of national data Ms. Kovacevic and Ms. Mihaljevic will be in charge. The further communication with Project Co-directors from Macedonia, Croatia and Bosnia and Herzegovina must proceed.
- Serbian partner will provide electronic version of the Neotectonic Map of the ex Yugoslavia territory (by Prof. iri ) as well as the Geological Map for the same territory. The MSO will make georeferencing of these maps, which will be used as two separate thematic GIS layers in the Project.

**SECOND DAY SESSIONS:**

Morning session was devoted to PSHA methodology and recent improvements of OHAZ software.

**Complete approach in probabilistic hazard assessment for Albania using OHAZ software** presented Prof. Llambro Duni. The earthquake data compilation and its completeness, declustering of time/space dependant events, magnitude conversion, and recurrence relationship, maximum expected magnitude assessment, as well ground motion prediction models used and the final PSHA results were presented.

Final improvements in OHAZ software realized since the previous Workshop were presented by Prof. Neki Kuka. The most important ones are as follows:

1. Accounting for unequal observational periods (completeness levels of the earthquake catalogs).
2. Estimation of the recurrence relationships (incremental and cumulative) in OHAZ.
3. Calculation of the site-source distance, replacing the previous procedure with an accurate geodetic method.
4. Extending the database of Predictive Ground-Motion Models (PGMM) with the following models:

~ Berge-Thierry et al. ( 2003)

- ~ Bindi et al. 2009 (update of the Sabetta-Pugliese 1996)
- ~ Akkar & Bommer 2007 and
- ~ Boore & Atkinson 2008 (NGA, EERI 2008).

Afternoon session was committed to PGM research and final decision making in respect to further activities.

**A Method for analysis and evaluation of ground motion models** was presented by Prof. Stamatovska, IZIIS Skopje, FYR Macedonia.

The parameter for analysis and comparison of different PGM was spectral pseudo velocity . PSV for 5% damping and period of  $T=0.2$  seconds taken as the representative of the low periods in the spectrum. Considered predictive models were chosen on the bases of:

- The time at which the ground motion models have been developed,
- The region (Europe) and the period for which the strong motion records have been obtained, and
- The empirical mathematical ground motion model and the method used for its determination.

In discussion afterwards the suggestion was made to:

- Extend the same comparison on the PGM implemented in OHAZ as well as to make recommendations on PGM considering the existing IZIIS strong motion data base.
- Prof. Akkar suggested that the next ADEA Conference in Ankara during November 2009 will be useful occasion on further development within this Work package and he invited Prof. Kuka and Prof. Stamatovska to participate.

### **Next Activities**

In addition to previously agreed, in open discussion the conclusions are that:

- The creation of thematic maps may start by producing next GIS layers: relief model of the BSHAP region, geological map, neotectonic map, epicenter map based on the final Catalogue data, etc.
- Prof. Kuka to prepare a short manual for new version of OHAZ, distribute the executive file and software source code.