Editorial

Heidi Kreibich · Maria Bostenaru Dan

Received: 13 January 2009 / Accepted: 13 January 2009 / Published online: 24 February 2009
© Springer Science+Business Media B.V. 2009

Natural hazards such as floods, avalanches, volcanic eruptions or earthquakes inflict losses to urban settlements and manmade infrastructure. The last decade of the twentieth century was dedicated to natural disaster reduction (IDNDR), aiming to decrease the loss of life, property destruction and social and economic disruption. However, despite an increase in awareness and knowledge, still more and more losses are registered, due to an increased vulnerability and climate change.

Risk research and damage mitigation of natural hazards on urban areas and infrastructure is a multi-, inter- and transdisciplinary issue. Several scientific fields contribute to the evaluation of capacities, vulnerabilities and hazards. Most frequent is the collaboration between scientists from natural and engineering sciences, like, for example, between seismologists and earthquake engineers. However, increasingly economists and social scientists are involved in the evaluation and assessment of the consequences of natural hazards. Additionally, employed are the instruments of urban planning, in both visualisation (such as GIS) as well as development and implementation of strategy concepts in pre- and post-disaster intervention. Looking to the future, also architectural aspects should be included in natural hazards research, namely, via “integrated conservation”, as cooperation between architecture and urban planning in urban regeneration, stipulated since the European Charter of the Architectural Heritage (1975) and the Declaration of Amsterdam (1975).

The session series on “Natural Hazards Impact on Urban Areas and Infrastructure”, which started 1999 within the European Geophysical Society XXIV General Assembly and

H. Kreibich (✉)
GFZ German Research Centre for Geosciences, Potsdam, Germany
e-mail: kreib@gfz-potsdam.de

M. Bostenaru Dan
ERGOROM'99 Foundation, Bucharest, Romania
e-mail: Maria.Bostenaru-Dan@alumni.uni-karlsruhe.de

M. Bostenaru Dan
“Ion Mincu” University of Architecture and Urban Planning, Bucharest, Romania
e-mail: maria.bostenaru@iaim.ro

was continued up to the annual EGU General Assemblies in Vienna, always aimed at a fruitful exchange between disciplines and realised this objective via a broad focus and various contributions from different scientific communities. The last two sessions in 2006 and 2007, of which the contributions formed the basis for this special issue, were convened by Maria Bostenaru Dan, then at Istituto Universitario di Studi Superiori di Pavia, Italy, and Heidi Kreibich, from the GFZ German Research Centre for Geosciences, Germany, with the last session featuring also the co-convenership of Agostino Goretti, from the Civil Protection Department, Rome, Italy. The editors of the special issue come from different fields. Heidi Kreibich is an environmental engineer, working on flood risk assessments, primarily on various aspects of vulnerability at the Hydrology Section, GFZ, Germany. Maria Bostenaru Dan graduated in architecture, with a focus on urban planning and worked in the field of earthquake hazards and risk, first at the Universität Karlsruhe (TH) in Germany, then at the Istituto Universitario di Studi Superiori di Pavia, European School for Advanced Studies in Reduction of Seismic Risk (ROSE School) in Italy. At present, she works at the ERGOROM'99 Foundation as well as at the “Ion Mincu” University for Architecture and Urban Planning in Romania, Conservation and Restoration chair and Centre for Architectural and Urban Studies.

This special issue features contributions about many kinds of natural hazards and their consequences. Apart from papers presented at the EGU sessions (de Graaf et al., Kreibich and Thieken, Schweier and Markus, and Lantada et al.), some papers were invited to achieve a more comprehensive view. It was hard work, but we are very pleased with the result and consider this as a well succeeded special issue.

Contributions were invited to the following topics:

- hazard and vulnerability assessment in urban areas,
- urban risk reduction strategies,
- risk mapping, visualisation and communication of the assessed effect of natural hazards on urban areas,
- emergency planning interventions,
- partnership models between the actors involved in the decision-making process for disaster mitigation, and
- lessons learned from the relationship between hazard, vulnerability and impact in recent events.

The papers range from hydro-meteorological hazards to geological hazards. The papers on climate change and floods are followed by papers dealing with natural hazards in mountainous regions, such as snow avalanches and volcanoes. Finally, two papers on earthquake risk are included.

Rutger de Graaf, Nick van de Giesen and Frans van de Ven from the Delft University of Technology, The Netherlands, wrote about “*Alternative water management options to reduce vulnerability for climate change in the Netherlands*”. Urbanisation plays a major role in increasing the vulnerability of urbanised low-lying areas in the western part of the Netherlands, alongside with land subsidence and sea level rise, the latter occurring due to climate change. The article explores possibilities to reduce vulnerability by implementing water management options. A vulnerability framework including four different capacities is presented.

The paper by Heidi Kreibich and Annegret H. Thieken (GFZ, Germany) explains “*Coping with floods in the city of Dresden, Germany*”. The city of Dresden was recently repeatedly hit by floods, which permits a comparison of the preparedness of authorities and households in 2002 after a long period of relatively low flood discharges and in

2005/2006 just a few years after a severe flood event. Before 2002 the flood awareness was low. After 2002 a new flood management concept was developed. Two-thirds of the households took precautionary measures. In the 2005 and 2006 flood events thus flood damage was significantly lower, due to the less severe flood situations and the much better preparedness.

The paper authored by Bruno Merz and Annegret H. Thielen (GFZ, Germany) deals with “*Flood risk curves and uncertainty bounds*”. The paper analyses aleatory and epistemic uncertainty. It is exemplified on the flood risk analysis for the city of Cologne, Germany. The risk analysis is performed in three modules, namely, flood frequency analysis, inundation estimation and damage estimation. Each of these modules has a different contribution to the total uncertainty.

The fourth paper also deals with a hydro-meteorological hazard, namely, snow avalanches in mountainous regions. It is authored by Mircea Voiculescu from the West University of Timișoara and entitled “*Snow avalanche hazards in the Făgăraș massif (Southern Carpathians): Romanian Carpathians—Management and perspectives*”. The impact of avalanches considered is that on human activities: the infrastructure, such as the Transfăgărașan Highway and also skiing, snowboarding, climbing and hiking. The impacts on forests are also covered. Outgoing from a situation of little research on avalanches in Romania before 1990 the needs and gaps of avalanche management are stressed, in the Făgăraș massif as well as in other mountains of Romania.

The next paper in the special issue deals with another mountainous hazard, namely, volcanic eruptions. Grant Kaye and Jim Cole from the University of Canterbury, and Andrew King and David Johnston from GNS Science, New Zealand wrote about the “*Comparison of risk from pyroclastic density current hazards to critical infrastructure in Mammoth Lakes, California, USA from a new Inyo craters rhyolite dike eruption versus a dacitic dome eruption on Mammoth Mountain*”. The paper first explains the geological background, going on with inventory databases which provide the foundation for the risk assessment. In the Mammoth Lakes the critical infrastructure is related to ski industry, such as chairlifts, but also roads, electricity transmission lines and other non-building infrastructure and critical buildings. Scenario eruptions and their risks are assessed in a probabilistic way.

The final two papers deal with earthquakes. The paper “*Vulnerability index and capacity spectrum based methods for urban seismic risk evaluation. A comparison*” by Nieves Lantada, Luis G. Pujades and Alex H. Bărbat from the Technical University of Catalonia focuses on pre-disaster measures. As in the first paper of the special issue, a vulnerability analysis is performed, and compared with capacity spectrum based methods for urban seismic risk evaluation. Two methods are considered: the first method defines the seismic action in terms of macroseismic intensity and seismic quality of buildings by means of a vulnerability index and thus the damage is estimated by semi-empirical functions. The second method defines the seismic action in terms of response spectra and the building vulnerability by means of capacity spectrum. Both methods were applied in the city of Barcelona, resulting in risk maps, which are of use for decision making in seismic risk prevention and mitigation, and also for emergency planning.

The paper by Christine Schweier and Michael Markus from the University of Karlsruhe, Germany is entitled “*Expert and information systems for technical SAR measures and buildings’ state evaluation*”. The focus is on post-disaster measures to minimise the impact of the natural hazard. Two expert and information systems are proposed to support the decisions of deployed field units in the aftermath of an earthquake. The first one is for search and rescue operations, while the other is for the evaluation of the building state.

The systems, integrated in a disaster management tool, are of use for the civil protection in emergency planning situations.

Not all papers that we would have liked to have could be included in this special issue, so we hope to organise another special issue in the near future.

Acknowledgements All participants of the EGU sessions are gratefully acknowledged. In particular, we thank all the authors for their high quality contributions and the reviewers for helping improving them, namely: Martha Liliana Carreño (Universidad Politécnica de Cataluña, Spain), Ji Chen (University of Hong Kong, Hong Kong), Donna Delparte (University of Calgary, Canada), Emil-Sever Georgescu (INCERC, Romania), Thomas Glade (University of Vienna, Austria), Agostino Goretti (Civil Protection Department, Italy), Ben Gouldby (HR Wallingford, United Kingdom), Andreas Kappos (Aristoteles University of Thessaloniki, Greece), Margreth Keiler (University of Vienna, Austria), Lucas Menzel (University of Kassel, Germany), Francisco J. Núñez-Cornú (Universidad de Guadalajara, Mexico), Jan Szolgay (Slovak University of Technology, Slovakia), Filippos Vallianatos (Technological Educational Institute of Crete, Greece), Sandro de Vita (Istituto Nazionale di Geofisica e Vulcanologia, Italy). Grateful thanks go to the European Geosciences Union, for giving repeated times the opportunity to convene this topical session and to Friedemann Wenzel from the University of Karlsruhe (TH) for having the initial idea for the session. Maria Bostenaru Dan thanks the European Geosciences Union for the award of a “Young Scientist’s Travel Award for Europeans” to attend the General Assembly in 2007. Many thanks to Andreas Kappos, member of the Editorial Board, for introducing guest editor Maria Bostenaru Dan to the editors of the journal. We gratefully acknowledge Vladimir Schenk, editor of the Natural Hazards Journal, for giving us the possibility to publish this special issue and for all the kind and valuable support throughout the work with the volume production. Warmest thanks for the efficient support of the publisher, Petra van Steenbergen and her assistants Nina Bennink and Ayrene Dialogo.