Preface

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Biographical notes: Ross B. Corotis is the Denver Business Challenge Professor of Engineering at the University of Colorado in Boulder, Colorado, USA, and past Chair of the Civil Engineering Section of the US National Academy of Engineering. His research interests are in structural reliability and built environment risk. He has chaired many committees and was the Editor of the *International Journal Structural Safety* and *ASCE Journal of Engineering Mechanics*. He has chaired the Executive Committee of IASSAR, served on the steering committee of the National Academies Disasters Roundtable, and authored more than 200 publications.

This special issue contains five papers that are extended versions of presentations made at the International Forum on Engineering Decision Making (IFED), held in Stoos, Switzerland, in December 2010. These were selected from 19 presentations based on their quality, creativity and broad level of applicability. IFED (http://www.ifed.byg.dtu.dk/) is held approximately every two years at locations around the world, and the Stoos workshop was the fifth.

The theme of the 2010 Forum was Global Catastrophic Risk Management: New Insights and Challenges. IFED focuses on risks associated with the built environment, with particular interest in the assessment of hazards and systems resilience and robustness, and effective risk policies and risk communication. Increasing economic and personnel losses in both developed and developing countries dictate innovative approaches to disaster risk management. The forum, and in particular these selected papers, address innovative analyses for this growing problem of risk assessment and management.

The first paper, 'Homeland security: a case study in risk aversion for public decision-making', by Stewart, Ellingwood and Mueller, uses utility theory to quantify the degree of risk aversion exhibited by the US Department of Homeland Security (DHS) following the 11 September 2001 terrorist attacks on the USA. The paper considers threat probability and averted losses, as well as risk reduction and cost of regulatory action. By comparing a 'do nothing' alternative with the reduction associated with the DHS annual expenditures, the authors are able to compute the risk aversion associated with the regulatory action.

Elms and Brown take a high-level view of infrastructure failures in 'Tales of the unexpected'. They point out that risk management is related to minimising the likelihood or consequence of failure, and that failure occurrence is often viewed as a surprise, related to the weight of concern by the engineers. They claim that most failures are a result of models used by engineers, developed to reflect this concern. They propose a

taxonomy of models, based on listed principles, and suggest that their approach is also relevant to engineering education.

In the third paper, 'On the governance of global and catastrophic risks', Faber addresses societal decision-making for managing such risks. The author considers what are the most important hazards, how can robust risk management strategies be developed in the face of large uncertainties, and the prioritisation of economic resources for global life safety and health. He categorises global catastrophes into three types: foreseeable events, leakage events (of continuous and largely ignored events), and unforeseeable large-scale events. The principle of marginal life-saving cost is used to develop a decision framework to manage risks and guide allocation of limited resources.

'Optimisation-based decision-making for complex networks in disastrous events', by Gómez, Buriticá, Sánchez-Silva and Dueñas-Osorio, appears next. The authors develop a network model for the allocation of limited resources to address large catastrophes. A systems approach avoids the increase in complexity normally associated with a global scale approach to such events. This is accomplished through a hierarchy of networks, with differing levels of abstraction using clustering algorithms, resulting in a very efficient solution. The approach also provides more informative topological information, and is applied to an example of support centres during an emergency.

The final paper, 'Acceptance criteria for risks of disasters with widespread effects', by Reid, discusses issues related to the need for new risk acceptance criteria for disasters with geographically broad effects. He points out that the consequences often extend beyond the jurisdiction of the regulating agency, thus affecting the usual approach to accountability and liability of the decision-makers. The paper includes a review of traditional societal risk criteria and identifies additional factors for consideration.

One additional paper emanated from forum and was accepted as part of the theme of this special issue, but was actually published in a prior issue of the journal: Volume 15, No. 4. That paper, 'Assessing global change when data are sparse', Maes and Dann pointed out that the low probabilities of occurrence associated with natural and industrial accidents lead to a sparseness of data. They introduced a hierarchical model to augment traditional statistical methods, based on combining similar hazards to provide more robust estimates. They illustrated the technique with an investigation into the changing frequency of tsunamis due to global climate change.