

## GUEST EDITORIAL

### Life-cycle of civil engineering systems

In recent years relevant advances have been accomplished in the fields of modeling, analysis, design, monitoring, maintenance and rehabilitation of civil engineering systems. Nowadays these developments are perceived to be at the heart of civil engineering, which is currently undergoing a transition towards a life-cycle oriented design philosophy. For this reason, after a series of International Workshops on Life-Cycle Cost Analysis and Design of Civil Infrastructure Systems held in Honolulu, Hawaii, USA (LCC1, 7–8 August 2000), Ube, Yamaguchi, Japan (LCC2, 27–29 September 2001), Lausanne, Switzerland (LCC3, 24–26 March 2003), Cocoa Beach, Florida, USA (LCC4, 8–11 May 2005), and Seoul, Korea (LCC5, 16–18 October 2006), it was decided to create the International Association for Life-Cycle Civil Engineering (IALCCE, <http://www.ialcce.org>).

IALCCE was founded in October 2006 during the 5th International Workshop on Life-Cycle Cost Analysis and Design of Civil Infrastructure Systems (LCC5). This Association covers all aspects of life-cycle assessment, design, maintenance, rehabilitation and monitoring of civil engineering systems. The mission of the Association is to become the premier international organisation for the advancement of the state-of-the-art in the field of life-cycle civil engineering. The objective of the Association is to promote international co-operation in the field of life-cycle civil engineering for the purpose of enhancing the welfare of society.

IALCCE has created fertile ground for the stimulation and promotion of research in the field of life-cycle civil engineering. It was therefore decided to bring together the main advances in the field of life-cycle engineering and related topics at the First International Symposium on Life-Cycle Civil Engineering (IALCCE'08), held in Villa Monastero, Varenna, Lake Como, Italy, 10–14 June 2008 (<http://www.ialcce08.org>). This Symposium has been organised on behalf of IALCCE under the auspices of Politecnico di Milano. The interest of the international civil engineering community in the activities covered by IALCCE has been confirmed by the significant response to the IALCCE'08 call for papers. In fact,

more than 200 abstracts were received by the Symposium Secretariat, and about 70% of them were selected for final publication as full papers and presentation at the Symposium. The proceedings of IALCCE'08 have been collected in the volume *Life-Cycle Civil Engineering*, published by CRC Press, Taylor and Francis Group, 2008, as a set comprising a hardbound book and a CD-ROM containing 150 papers, including eight keynote papers and 142 technical contributions from 28 countries.

The extended version of 15 selected papers included in the proceedings are published in this special issue of *Structure and Infrastructure Engineering*. These papers deal with the state of the art as well as emerging concepts and innovative applications in the field of life-cycle civil engineering and related topics. Ang presents a practical approach for life-cycle consideration in formulating risk-informed decisions in planning and design of infrastructure systems. The paper by Moan deals with reliability-based procedures for life-cycle assessment, design, inspection and repair of fixed offshore platforms. Esteva *et al.* give an overview of life-cycle optimisation in the establishment of reliability- and performance-based seismic design requirements for multi-storey systems. Malerba provides an insight into the restoration of the historical-monumental part, and the design of the buildings for the new scenery requirements, of the Teatro alla Scala in Milan, Italy. Life-cycle cost design concepts and methods for bridges and road networks are discussed in Furuta *et al.*, with an approach to a multi-objective performance optimisation. Arangio *et al.* apply the concept of dependability to structural engineering and present a strategy for the assessment of the life-cycle integrity of a system by means of structural monitoring. Messervey *et al.* show how statistics of extremes can be used to enhance the assessment and performance prediction of monitored highway bridges. Papè and Melchers report observations of the long-term performance of beams taken from a prestressed concrete road bridge and tested in laboratory to assess the remaining load capacity. Biondini *et al.* investigate the lifetime seismic performance of concrete structures with emphasis on precast

buildings and show how the hierarchy of strengths, claimed for a capacity design of the structure, can be affected by the time-evolution of damage. Results of experimental tests carried out on corroded concrete members are presented in Oyado *et al.*; these results are used to study the influence of the amount and distribution of reinforcement corrosion on the bending capacity. Oller *et al.* investigate the debonding process of beams strengthened by fiber-reinforced polymer laminates and provide a limit value for the transferred force at the interface between concrete and laminate. Ceccoli *et al.* presents the results of the experimental activities and numerical analyses carried out for the safety assessment and structural retrofit of the monumental building Palazzo della Civiltà Italiana in Rome, Italy. The paper by Sickert *et al.* deals with computational methods for the optimal design under imprecise probability of strengthening layers made of textile reinforced concrete applied on surfaces of concrete

structures. Crispino *et al.* present the results of a full-scale experimental study carried out to test the effects of different compaction procedures on the final degree of compaction of different asphalt mixes. Finally, Clobes and Peil give an overview of the identification of aerodynamic admittances in full-scale measurements for predicting the life-cycle performance of guyed structures under turbulent wind.

The Editors hope that this special issue will provide a valuable reference to all concerned with life-cycle performance of civil engineering systems.

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