Preface

In the past, old facilities which were considered to be at the end of their useful service life were demolished and replaced with new ones that better met the functional requirements of modern society, including new safety standards. However, humankind has recently recognised the threats to the environment and to our limited natural resources posed by the relentless determination to destroy the old and build anew. Awareness of these constraints and the increased emphasis on sustainability lead to the need to rehabilitate our existing structures and extend their service life as long as possible, regardless of economic or functional considerations which would have led in the past to their demolition and replacement. Indeed, while upgrading the well-known "Construction Products Directive" 89/106/CEE to the "Construction Products Regulation" 305/2011/EU, the European Union added a 7th "Essential Requirement": for sustainable use of resources. It is reminded in this regard that, according to the European Commission, the imperative to meet the first two "Essential Requirements", namely those for mechanical resistance and stability and for safety in case of fire, is the basis of the Eurocodes. It is not a coincidence, therefore, that the forthcoming revision of the set of ten EN-Eurocodes towards their second generation will include the new dimension of rehabilitating existing structures, after going through an evaluation of their structural condition and safety. Apart from the need to meet the new formulation of the "Essential Requirements" in Regulation 305/2011/EU, the EN-Eurocodes recognise with this extension of their scope the coming economic and societal realities and their impact on the Construction Sector, as retrofitting of existing facilities will increase at the expense of new construction.

The majority of the existing building stock and of civil infrastructures are seismically deficient. So, when the time comes for a decision to prolong their service life with the help of structural and architectural upgrading, the issue of seismic retrofitting arises. Besides, it is often decided to upgrade the earthquake resistance of facilities that still meet their functional requirements and fulfill their purpose from an architect's point of view, but are clearly unsafe in the event of an earthquake. It is indicative of the importance of seismic retrofitting for public safety that the only one in the set of 56 Parts in the first generation of EN-Eurocodes which

deals with existing structures is Part 3 of Eurocode 8 on "(Seismic) Assessment and Retrofitting of Buildings". This Part will be one of the four focus areas in the upcoming revision of Eurocode 8 towards the second generation: the revision will encompass a major overhaul of the Normative part, including, among others, incorporation of specifics presently in the Informative Annexes, as well as extension of the scope to cover seismic assessment and retrofitting of bridges, presently a major void in Eurocode 8.

In order to decide how badly an individual structure needs seismic upgrading or to prioritise the rehabilitation of a population of structures, a seismic evaluation or assessment of the as-built structure is necessary. Such an evaluation may be carried out at various levels of approximation or sophistication, depending on the scale considered and the resources available. The outcome of the evaluation normally serves as a guide for the extent and details of the strengthening intervention, as well as for the technique to be used. Modern seismic codes or standards do not sufficiently cover the delicate phase of seismic evaluation nor the many potential technical options for seismic upgrading; therefore experimental and analytical research in these two areas is on-going and the state of the art is constantly evolving. All the more so as seismic evaluation and rehabilitation demand considerable expertise in order to make best use of the available safety margins in the existing structure, to adapt the engineering capabilities and techniques at hand to the particularities of a project, to minimise disruption of use or nuisance to occupants, etc. Further, as old structures are very diverse in terms of their materials, layout, etc., seismic retrofitting does not lend itself to straightforward codified procedures or cook-book approaches. As such seismic evaluation and rehabilitation need the best that the current state of the art can offer on all aspects of earthquake engineering: from the subsoil and its role in the event of an earthquake to the mechanical behavior of novel retrofitting materials and components.

In this volume, top seismic experts and researchers from around the world present the most recent outcomes of their work on seismic evaluation and retrofitting and closely related subjects. Many of the authors are partners in SERIES ("Seismic Engineering Research Infrastructures for European Synergies", www.series.upatras.gr, the largest research project in earthquake engineering in the European Union's 7th Framework Programme, FP7/2007–2013) supported under grant agreement n° 227887 of the Research Infrastructures Programme in FP7, or external researchers who have used Europe's seven largest and most advanced seismic testing facilities in the framework of SERIES.

The SERIES Workshop on the "Role of Research Infrastructures in Seismic Rehabilitation" took place in Istanbul in February 2012 and attracted a large audience to listen to renowned experts from around the world presenting close to 30 invited contributions. The Workshop itself and the publication and diffusion of these Proceedings are part of the Networking Activities of the SERIES project and have been made possible through European Community funding.

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