Editorial

Disaster resilience education in the built environment

The construction industry delivers the buildings and infrastructure that are needed by society. Disaster-related casualties and economic losses are often determined by the extent to which these buildings and infrastructure assets are damaged, so that the industry and the built environment professionals employed within it have a central role to play in helping our communities become more resilient to disasters. The importance of engaging built environment professionals more extensively in disaster risk reduction, response and recovery is widely acknowledged, as is the need to continuously improve their knowledge base so they are better able to contribute to resilience building efforts.

The Sendai Framework for Disaster Risk Reduction, endorsed by 187 member states of the United Nations in 2015, recognised the need to promote the incorporation of disaster risk knowledge in formal and professional education and training. Similarly, one of the construction industry's key professional bodies, the Royal Institution of Chartered Surveyors (RICS) has underlined "[. . .] the importance of a massive rethink around how we build up skills across the sector to meet the challenges we're facing [. . .]" (RICS, 2015). These calls highlight the need for greater integration of disaster resilience concepts into the education of built environment professionals.

In recognition of these challenges, an EU funded project entitled Collaborative Action towards Disaster Resilience Education (CADRE) was launched in 2013, with an aim to identify mechanisms to mainstream disaster resilience in the construction process. The CADRE project brought together experts from the University of Huddersfield, UK; Vilnius Gediminas Technical University, Lithuania; Tallinn University of Technology, Estonia; Northumbria University, UK; the United Nations International Strategy for Disaster Reduction, Switzerland; the University of Moratuwa, Sri Lanka; and the Federation of Sri Lankan Local Government Authorities, Sri Lanka to investigate these mechanisms. As part of the CADRE initiative, a special issue on disaster resilience education in the built environment was launched to share experiences and to encourage dialog.

This special issue consists of four articles, and these articles were published in the Volume 9 Issue 4/5. The first two address the broader, contextual issues regarding the knowledge requirements of built environment professionals, with respect to disaster resilience and how these relate to relevant international policy frameworks. Two further articles offer detailed insights into specific competency requirements and pedagogical approaches for disaster resilience education.

The first article (pp. 348-367) sets the context for disaster resilience education in the built environment by identifying the gaps in the knowledge base of construction professionals that are currently undermining their ability to contribute to societal disaster resilience. Amaratunga *et al.* present the results of a comprehensive study of construction professionals' knowledge requirements throughout the property cycle with respect to five dimensions of resilience (social, economic, institutional, environmental and technological) and in relation to key built environment stakeholder groups (national and local government organisations; the community; NGOs, INGOs and other international agencies; academia and research organisations; and the private sector). On the basis of 87 interviews of practitioners from Europe and Asia, an analysis of disaster resilience and management

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policies as well as focus group discussions, 13 key areas of knowledge gaps and their sub-themes are identified and detailed recommendations for education, research, policy and practice as well as cross-cutting recommendations are proposed to mainstream disaster resilience in the construction process.

In related research, Perera *et al.* map built environment professionals' knowledge requirements to three major current international policy frameworks: the Sendai framework for Disaster Risk Reduction 2015-2030, the Sustainable Development Goals and the Paris Climate Change Agreement (COP21) (pp. 368-384). The knowledge requirements were identified as part of the overall study described in the first article by Amaratunga *et al.*, with respect to one of the key stakeholder groups – community stakeholders. This mapping exercise explicitly associates each of the identified knowledge areas with the corresponding policy priorities of the three international policy frameworks. In doing so, it helps to indicate which knowledge gaps in existing curricula need to be bridged to meet the demands of current international policy frameworks.

In the third article (pp. 385-401), Bhattacharya *et al.* investigate the barriers and opportunities for built environment professionals to provide advice on flood risk to commercial properties and identify the corresponding capacities and skills to be further strengthened through education and training. Semi-structured interviews were conducted with Chartered Surveyors and other experts from five countries (Australia, UK, US, China and Germany). A number of recurring themes emerged across all the case study countries, in particular, a need for education and training. The article outlines core competency requirements for built environment professionals in relation to flood risk, which have important implications for both practitioners and educators.

Meyer *et al.* propose an interdisciplinary pedagogical strategy for resilience planning on the basis of a project, which engaged university faculty and students, high school students, local residents and environmental justice organisations in assessing and monitoring the performance of storm water infrastructure in a vulnerable neighbourhood in Houston, Texas (pp. 402-419). The article describes the participatory action research approach adopted to support the community in understanding hazards and climate change implications, identifying infrastructure renewal and adaptation needs and collecting and preparing data at the neighbourhood level for community- and city-level resilience planning.

Chamindi Ishara Malalgoda
Department of Architecture and 3D Design, University of Huddersfield, Huddersfield, UK, and
Emlyn Witt
Tallinna Tehnikaulikool, Tallinn, Estonia