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Original Citation

Malalgoda, Chamindi, Amaratunga, Dilanthi, Haigh, Richard and Keraminiyage, Kaushal (2015) Integrating universities with the built environment practice and the communities in disaster management education. In: Proceedings of the 8th International Conference of Faculty of Architecture Research Unit (FARU). University of Moratuwa, Colombo, Sri Lanka, pp. 433-446. ISBN 978-955- 9027- 53-9

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Rajapaksha.U, et al (eds), 2015, "Making built environments responsive": *Proceedings of the 8th International Conference of Faculty of Architecture Research Unit (FARU), University of Moratuwa, Sri Lanka*, pp. 000–000. ©

INTEGRATING UNIVERSITIES WITH THE BUILT ENVIRONMENT PRACTICE AND THE COMMUNITIES IN DISASTER MANAGEMENT EDUCATION

CHAMINDI MALALGODA¹, DILANTHI AMARATUNGA², RICHARD HAIGH³
and KAUSHAL KERAMINIYAGE⁴

^{1,2,3,4}*Global Disaster Resilience Centre, University of Huddersfield, Huddersfield, UK*

c.malalgoda@hud.ac.uk

Abstract. Built environment (BE) practitioners have a key role to play in developing societal resilience to disasters. In doing so, various interactions are needed between BE disciplines and other stakeholders engaged with the disaster management process. Therefore universities conducting courses on disaster management need to consider the needs of these stakeholders in their programme design and delivery. This requires building partnerships between universities, BE practice and other stakeholders engaged in disaster management who are referred to as ‘community’ in this research. Previous research has highlighted the lack of integration between practice, community and university (PCU) in contributing to the societal resilience to disasters and therefore it is very important to strengthen the integration between PCU. Development of such partnerships is a complex task and it is important to identify how PCU integration can take place and how the effectiveness of such integration can be measured. Accordingly, the aim of this paper is to present the initial PCU framework developed as part of an EU funded project, aimed at developing a professional doctorate for disaster resilience in the built environment. The methodology adopted for this research comprises of a literature review and brainstorming. The paper presents several mechanisms to integrate universities with the BE practice and communities in developing meaningful partnerships in the proposed professional doctorate, some of which include, collaborative programme design, delivery, research and supervision.

Keywords. *Disaster resilience; professional doctorate; built environment practice; stakeholders; partnerships*

1. Introduction

Education is one of the key elements in reducing the risk of natural disasters (Shaw et al., 2009). Education builds knowledge, skills, understanding and

confidence to, prevent, mitigate, prepare for, respond and recover from the impacts of natural disasters. The importance of disaster education was formally recognised by the Hyogo Framework for Action (HFA 2005-2015) where ‘education, training and capacity building’ was identified as one of the main pillar of the framework. As a result of ever increasing threats of natural disasters, Sendai Framework for Disaster Risk Reduction (2015-2030) (SFDRR) has re-emphasised the importance of educational measures in reducing the disaster risk and called for “*integrated and inclusive educational measures that prevent and reduce hazard exposure and vulnerability to disaster, increase preparedness for response and recovery, and thus strengthen resilience*” (UNISDR, 2015).

There is a growing recognition on the Built environment (BE) professions’ role in disaster management (Max Lock Centre, 2009, Boshier and Dainty, 2011, Haigh and Amaratunga, 2010), and it is important that they possess relevant professional skills and expertise to strengthen resilience. As such, disaster management education and training is considered essential in making BE professionals more responsive to disaster events (Siriwardena et al., 2013). Education and training on disaster resilience can be provided in numerous ways and SFDRR highlighted the importance of promoting the incorporation of disaster risk knowledge, in formal and non-formal education, as well as in civic education at all levels, as well as in professional education and training (UNISDR, 2015). Hence, it is important that we design educational and training programmes for BE professionals in disaster resilience in order to enhance their capabilities in dealing with disaster related matters.

Education and training for BE professionals are usually provided by Higher Education Institutes (HEIs); vocational education and training providers; built environment professional bodies; construction organisations, and training and development authorities (Thayaparan et al., 2015). Out of these, contribution made by HEIs in enhancing BE knowledge base is widely recognised in practice as well as in the academic literature (Witt et al., 2014, Thayaparan et al., 2015). HEIs mostly offer organised programmes which are recognised by a qualification or part of a qualification and hence the learning opportunities provided by the HEIs are normally classified as formal learning (OECD, 2004). Number of drawbacks yet exists in formal learning opportunities of disaster management provided by HEIs, some of which are, complexity and multi-disciplinary nature of the subject; lack of industry involvement and the lack of research and development activities on disaster management by construction sector professionals (Siriwardena et al., 2013).

In supporting the concept of lifelong learning and in overcoming the above-mentioned challenges, EU funded CADRE (Collaborative Action towards Disaster Resilience Education) project intends to develop a professional doctorate (DProf) in disaster resilience in the built environment. By developing a professional doctorate, it is expected that challenges such as, complexity and multi-disciplinary nature of the subject; lack of industry involvement; and lack of research and development activities on disaster management by built environment professionals, could be tackled successfully (Malalgoda et al., 2015). A key component of the proposed professional doctoral programme is the identification of the relevant parameters, which will help to establish a framework that defines the integration of Practice, Community and University (PCU) within the context of the construction industry to increase societal resilience to disasters. Recognising the fact that interactions among PCU stakeholders is complex, the PCU framework will then identify the nature of the PCU integration which helps the development of the proposed programme, creating the necessary intra PCU feedback and feed-forward mechanisms to enable effective lifelong learning. The dynamic nature of such interactions is complicated; hence it is also necessary to establish measures to monitor the effectiveness of such integration. Accordingly, this 'framework' identifies how such integration should take place, and how the effectiveness of such integration can be measured. Accordingly, the aim of this paper is to present the initial Practice, Community and University (PCU) framework developed as part of the CADRE project.

The methodology adopted for this research comprises of a literature review and brainstorming. The outcomes of the literature review provided a basis for the brainstorming exercise. The framework was developed based on the outcomes of two brainstorming exercises conducted by the project partners. Brainstorming sessions were conducted as part of two organised workshops. Before the start of the brainstorming, initial literature findings were presented to the audience and the ground rules were set. 12 participants attended the first brainstorming exercise and 9 participants attended the 2nd brainstorming exercise. Participants comprised of academics, researchers and representatives of non-government organisations relating to built environment and disaster management.

2. The PCU framework

The need for collaboration between industry and higher education was highlighted by various authors such as Williams (2005), Siriwardena et al.

(2013), Thayaparan et al. (2015) and Ozansoy et al. (2009). Since the Lambert Review (2003), there has been a growing debate on the need for collaboration between industry and academia and a huge change in both quantum and quality of such collaborations has been observed (DL, 2012). Williams (2005) argued that the engagement of the construction industry with higher education is critical to the future success of the UK economy and highlighted the importance of aligning teaching, learning and assessment with the requirements of professional bodies, industry and universities. Similarly, Ozansoy et al. (2009), argued that in engineering education university/industry/community projects are beneficial to all parties and useful in helping students to develop work-related skills.

There has been a widespread agreement between academic literature on the importance of developing disaster resilient and management capacities. In supporting academic literature, Sendai Framework has identified the need of enhancing the capacities of relevant stakeholders and industries. Accordingly, the framework suggested to “*build the knowledge of government officials at all levels, civil society, communities and volunteers, as well as the private sector, through sharing experiences, lessons learned, good practices and training and education on disaster risk reduction*” (UNISDR, 2015). The intension of the current research is to address this capacity gaps by developing a professional doctorate in disaster resilience in the built environment. Teaching disaster resilience and management require, multi-sectoral and multi-stakeholder engagement (Thayaparan et al., 2015) and thus, designing and delivery of education programmes catering built environment practitioners require collaboration between all disaster related stakeholders, BE practice and the university. However, Siriwardena et al. (2013) observed a significant lack of collaboration between HEIs, industries, professional bodies and communities in the context of disaster resilience in the built environment. Thus, it is very much important to develop mechanisms to integrate all disaster related stakeholders, BE practice and the university in order to ensure success in the DProf programme development and delivery. Accordingly, a key component of the proposed professional doctoral programme is the identification of the relevant parameters, which will help to establish a framework that defines the integration of Practice, Community and University (PCU) within the context of the construction industry to increase societal resilience to disasters. The initial framework is depicted in Figure 1. The next section elaborates the key components of the framework.

2.1. KEY COMPONENTS

2.1.1 Practice (P)

Construction sector has an enormous role to play, before, during and after a disaster (Bosher and Dainty, 2011, Haigh and Amaratunga, 2010, Ofori, 2004) and as such, it is important that built environment professionals to engage more widely in disaster risk reduction and response and to address the problems of building, infrastructure and land (Max Lock Centre, 2009). Accordingly, in this research, the term ‘practice’ refers to the practices associated within the built environment. According to Max Lock Centre (2009), main practices associated within built environment are, architecture, engineering, planning and surveying.

2.1.2 Community (C)

Disaster resilience and management is a complex task which requires numerous efforts of various stakeholders such as; local government decision makers, city officials and departments, central and provincial governments, the private sector, civil society, non-governmental organisations, community based organisations, research institutions and institutions of higher learning (Niekerk, 2007). All these stakeholders engage with built environment practice in increasing societal resilience to disasters. Therefore, with reference to the PCU framework, the term community refers to all these stakeholders except for the research institutions and institutions of higher learning as these stakeholders are separately identified under the category of ‘university’.

2.1.3 University (U)

There are various definitions associated with the term universities. More commonly, universities are referred to as Higher Education Institutes (HEIs). According to the UNESCO (2007), higher education includes ‘*all types of studies, training or training for research at the post-secondary level, provided by universities or other educational establishments that are approved as institutions of higher education by the competent State authorities*’. Accordingly, these institutions are entitled to deliver certificate/ diploma/ degree/ masters and doctoral level awards. Since the current study aims at developing a professional doctorate, the study define universities as an institution which is approved as an institution of higher education by a competent state authority and has the capability and authority to deliver doctoral level programmes.

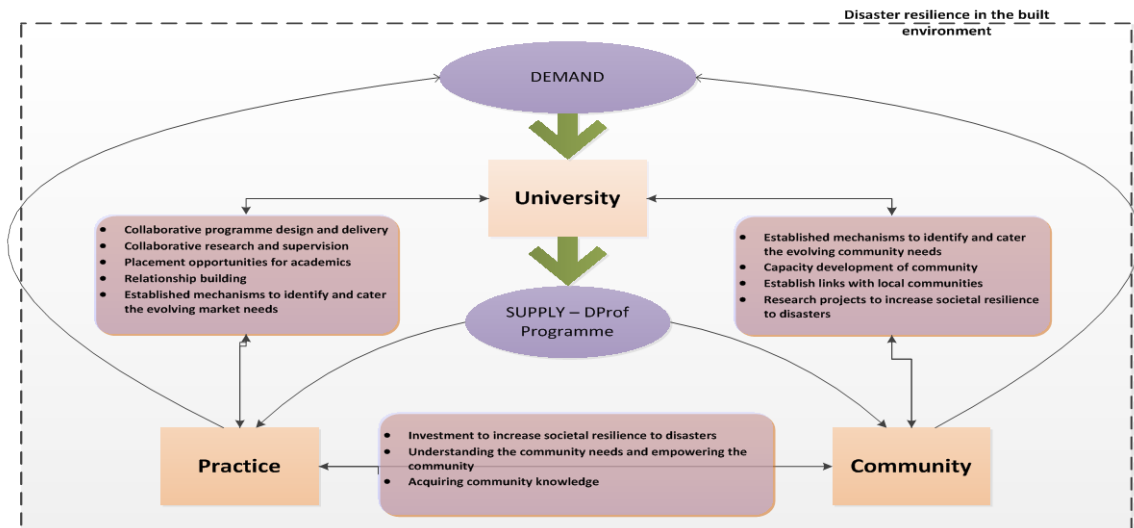


Figure 1, PCU framework

2.1.4 Demand

Before developing the proposed DProf programme, it is important to improve the understanding of the experiences, needs and expectations of BE practice and community partners. As such, current and emerging demands for disaster resilience and management need to be captured and it is referred to as ‘demand’ in the framework. In this instance, the demand was captured by an extensive primary and secondary data collection and an analysis process. Accordingly, the first phase of research involved, capturing the needs of 5 stakeholder groups associated in disaster resilience and management, as well as current and emerging skills and competencies, applicable to built environment professionals towards enhancing societal resilience to disasters. The primary and secondary data generated a long list of needs and skills with respect to the property lifecycle stages under the respective dimensions of resilience. Finally, the identified needs and skills were combined ‘like-for-like’ to produce broader level of competencies. In parallel an extensive policy analysis was conducted to capture the emerging policy level needs in the disaster resilience in the built environment. Accordingly, it is expected to develop the professional doctorate integrating these needs in order to make it more attractive to the practitioners and to increase the relevance to the community and policy needs. Capturing demand is not a one off task, and this

need to be done regularly in order to make sure that all current and emerging needs in the market are considered.

2.1.5 Supply – DProf programme

After capturing the current and emerging needs, the next step is to develop a professional doctorate in disaster resilience in the built environment. Due to shortcomings of the traditional doctoral programmes in addressing the needs of the industry and professionals, professional doctorates have become increasingly recognised (Kot and Hendel, 2012). The UK Council for Graduate Education has defined a professional doctorate as '*a programme of advanced study which, whilst satisfying the university criteria for the award of a doctorate, is designed to meet the specific needs of a professional group external to the University, and which develops the capability of individuals to work within a professional context*' (UKCGE, 2002). Accordingly, it is intended to develop a structured professional doctorate, which reflects how the construction sector and its professionals could contribute in achieving resilience for increasing threats from natural and human induced hazards.

3. PCU integration

Importance of integrating universities, practice and communities were undoubtedly evident in various academic literature (Williams, 2005, Ozansoy et al., 2009, Strier, 2011). However, only little evidence was found in relation to disaster resilience in the built environment. Authors such as Thayaparan et al. (2015) and Siriwardena et al. (2013) have discussed the importance of integrating universities, industries and communities in the construction to develop societal resilience to disasters but none of these were directly related to a development and delivery of a professional doctorate. Nevertheless it is important to analyse existing methods of collaboration in proposing the integrating mechanisms for proposed professional doctorate. Hence this section provides a synthesis of existing mechanisms of integrating, universities, practice and communities.

According to Williams (2005), industry–university collaboration can operate at different levels ranging from individual modules, to entire courses informed or sponsored by industry partners. It is believe that these types of collaboration will help to bridge the gap between supply of graduates and the demand by the industries. Similarly, Ozansoy et al. (2009) have identified industry and community partners as key players of all programmes and courses at Victoria University, Australia and explored the matters related to

collaboration of academics and industry professionals in engineering education. Accordingly the authors have discussed about the key roles and responsibilities that the practitioners can play in the design of the courses, facilitation of the projects and the assessment of student learning. Some of the key suggestions were, identifying industry/community partners and engaging them in university programmes, selecting appropriate projects for students with varying backgrounds and capabilities, team formation, developing curriculum to suit changing career needs in the industries, encouraging industry experts to actively participate in teaching, project supervision, facilitation and assessment (Ozansoy et al., 2009). Adding to these, Williams (2005) highlighted the importance of engaging employers in the development of the content and structure of the course. In addition, inviting industry experts for lectures and workshops are highly regarded in educating engineering students (Miau et al., 2001). According to DL (2012), there are good practices in business-university collaborations in degree programme design, delivery and sponsorship which displayed clear advantages for the students, company and university. DProf programmes usually consist of taught and a research components and all of these mechanisms are directly applicable for the design and delivery of the proposed DProf programme where partnerships are sought with the built environment practitioners and all stakeholders related to disaster resilience and management. Another possible engagement strategy proposed by Williams (2005) was by sponsoring students to meet their organisational needs. This strategy is very much applicable to the context of the DProf programme where companies can sponsor their employees to research on a topic, which is of particular interest to the practice. Both companies and universities would benefit from such an arrangement, which facilitate practice-oriented research. As emphasised by Ozansoy et al. (2009) in such an arrangement, industry/community partners can help students throughout their course and can act as mentors together with the academics of the university. Besides, industry/community partners can engage as part of the assessment panel in evaluating the student outcomes. Accordingly it is clear that a PCU integration framework will be a useful tool in ensuring the needs of practice and community are considered in the programmes delivered by HEIs. During the brainstorming sessions, a number of concepts came up on integrating practice, communities and the university within the proposed DProf programme in disaster resilience in the built environment. Accordingly, the next section highlights the main findings of the brainstorming sessions.

3.1. PRACTICE – UNIVERSITY INTEGRATION

This section elaborates the nature of practice and university integration. Number of mechanisms have been identified through brainstorming to strengthen such integration in the proposed DProf programme and are detailed below.

One of the important means of integrating practice and university is via collaborative programme design and delivery. DProf programmes are usually consisting of taught and research components. In terms of taught components, input of practitioners could be sought in identifying emerging market needs in disaster resilience in the built environment; developing and upgrading of curricular and syllabuses of disaster resilience and management; developing teaching materials; teaching; organising industry placements for students; and, assessments and student feedback. Another important means of integrating practice and universities is to organise guest lectures from BE practitioners. In doing so, students can be benefitted from industry specific knowledge and understanding in the point of view of various disaster related stakeholders. They can bring in real life examples and data and therefore this provides a valuable means for universities to formally integrate with the practice and to capture the industry specific knowledge and understanding. Universities can also organise other formal, non-formal and informal learning opportunities for practitioners with the developed modules to enhance their knowledge and skills in disaster resilience and management. As such it is clear that, collaborative programme development and delivery is one of the means of integrating universities and practice.

The next component of the DProf programme is the research component. The proposed DProf programme facilitates students to research on a topic, which is directly relevant and linked to their professional practice. Accordingly, collaborative research plays an important role in integrating universities and practice and provides opportunities for universities to design and implement research activities directly relevant to the professional practice. This provides opportunities for universities to provide valuable contributions to the practice. However, it is important that these contributions are disseminated via appropriate means, which is reachable and understandable to the practice. Moreover, cross university/ practice supervisory teams can be formed in order to ensure high quality research and mutual learning. In integrating practice and universities in developing societal resilience to disasters, it is also important to provide industry specific knowledge and experience to academics. In doing so, industries have to play a vital role in terms of

providing career, placement and training opportunities to academics. Accordingly, it is important to build formal links between practice and universities to exchange knowledge and skills.

As explained earlier, universities and practice could be integrated via various methods, such as, collaborative teaching; collaborative research; career, placements and training opportunities; guest lectures etc. All these provide opportunities for the two sectors to collaborate and to build formal relationships. These relationships need to be strengthened via organising various forms of engagement activities, social events and establishing formal links between the university and practice. Commitment of the parties is an important element in sustaining these engagement activities and it is important to ensure mutual benefit. In doing so, it is also important to lay down how these said activities could be sustained in the longer term.

Disaster resilience and management is an evolving discipline, which requires enormous efforts of various stakeholders. On the other hand, practitioner needs are dynamic and evolving, and as a result universities need to establish formal as well as informal mechanisms to capture the evolving needs of the BE practice. Accordingly, within the proposed DProf programme, the universities need to ensure that they are conducting and delivering appropriate teaching and research to cater the dynamic and evolving needs of the practice. It is very clear that universities cannot work in isolation and they require support from the BE practitioners and as a result BE sector needs to get involved with the universities to ensure the effectiveness of this exercise. Accordingly the integration of practice and universities are of paramount importance to identify and cater the evolving needs of the practice.

3.2. COMMUNITY – UNIVERSITY INTEGRATION

This section elaborates the nature of community and university integration. Number of mechanisms have been identified to strengthen such integration in the proposed DProf programme through brainstorming, and are detailed below.

Community represents most of the stakeholders attached to disaster resilience and management including, government, non-government, community and voluntary based organisations, private sector and disaster affected and other vulnerable population. It is obvious that these stakeholder groups have dynamic needs in relation to developing societal resilience to disasters. Accordingly, they expect BE practitioners to possess with required knowledge and skills to fulfill their dynamic needs in relation to disaster resilience in

the built environment. Hence, universities are required to capture the needs of the community and consider them in the design and delivery of the proposed DProf programme. In doing so, universities need to establish formal as well as informal mechanisms to capture the evolving needs of the community. Universities need to work with all related community groups to understand their needs and social settings. Accordingly, the universities need to ensure that they are delivering appropriate teaching and research in the DProf programme to cater the needs of various forms of community groups. It is very clear that universities cannot work in isolation and they require support from the community stakeholders and as a result, communities need to get involved with the universities to ensure the effectiveness of this exercise. Accordingly the integration of communities and universities are of paramount importance in the development of the proposed DProf programme.

Universities can effectively engage in developing capacities of communities. These can be done via organising and facilitating, training programmes, counselling, capacity building workshops etc. and particularly through the proposed DProf programme. By engaging in such programmes, universities can provide an enormous service to communities to better prepare them for future disasters. In doing so, universities will get an opportunity to engage with communities and will be able to learn the community needs and wants and other ground level conditions. These engagement activities in turn would help universities to effectively align the DProf programme to emerging needs of the communities.

Another important way of integrating the community is by establishing links with the local community. Universities can organise public lectures for the local community, which provide an important opportunity to integrate with local communities and community leaders. On the other hand, universities can participate in community level programmes and share their knowledge and experience with the local community. All these will help universities to integrate with the community and to understand what community really wants from the BE practitioners and in turn these will help to align the DProf programme with the needs of the community.

Universities can also integrate with the communities via various research projects. Universities can invest in research which directly address the community needs and which facilitate enhancing the societal resilience to disasters. In conducting these projects, universities will get an opportunity to integrate with various community stakeholders, in preliminary investigations, data collection and research dissemination.

3.3. PRACTICE – COMMUNITY INTEGRATION

This section elaborates the nature of practice and community integration. Number of mechanisms have been identified to strengthen such integration in the proposed DProf programme through brainstorming and are detailed below.

BE practices are expected to invest in disaster resilience and management programmes to increase societal resilience to disasters. Since due to the multi disciplinary nature of the subject, it is of paramount importance to engage communities in such programmes. Communities need to be consulted in advance to identify their needs and wants and the investments need to be aligned with what community really wants in terms of making societal resilience to disasters. In doing so, it provides opportunity for the BE practices to get involved with the community and work together to make more resilient cities and local environments.

Communities need to be empowered to take shared responsibility in coping with disasters. BE practices have to play a vital role in empowering the community, especially the disaster affected population. In doing so, it is very important to understand the needs of the community and to develop their capacities to make them empowered. In terms of capacity building, BE practices can organise, capacity building workshops, provide livelihood support, and, assist them to rebuild the properties etc. In doing so, BE practices get the opportunity to work with the community and to understand their needs and wants. These will facilitate the integration between the community and the BE practice.

On the other hand, during the brainstorming, there was a special attention to the local communities. Local communities are more knowledgeable on ground level conditions and vulnerabilities. As such they are more aware of the local geology, the hazard context, and the livelihood options and therefore they must be involved in disaster management programmes conducted by the BE practices. By engaging communities in such programmes and with community centred approaches, BE practices would be able to acquire local knowledge and to make more informed decisions with regard to enhancing resilience of cities and communities. In doing so, it is very important to promote community participation and to make all the community groups involved in order to make this initiative a success.

4. Conclusions

Paper elaborates how the integration of practice, the communities and the universities should take place in the proposed DProf programme. According-

ly, a PCU framework has been developed as shown in Figure 1. The framework is subject to further refinements as the project progresses. Due to the complex and dynamic nature of PCU integration, it is also necessary to establish measures to monitor the effectiveness of such integration. Accordingly, continuous feedback and feed forward mechanisms are established to ensure the applicability of the professional doctorate to the needs of the BE practice. Accordingly, findings of the labour market needs, skills and competencies are first reviewed by project partners and the steering committee. After the initial refinement, number of stakeholder seminars and validation seminars are proposed to further refine the identified list of competencies. Accordingly, the programme's direct applicability to the needs of practice and communities can be ensured.

5. Acknowledgements

CADRE research project has been funded with support from the European Commission. This publication reflects the views only of the authors, and the Commission cannot be held responsible for any use, which may be made of the information contained therein.

6. Reference

- Bosher, L. & Dainty, A. 2011. Disaster risk reduction and 'built-in' resilience: towards overarching principles for construction practice. *Disasters*, 35, 1-18.
- DI, T. W. 2012. A Review of Business–University Collaboration. London, UK: Department for Business, Innovation and Skills.
- Haigh, R. & Amaratunga, D. 2010. An integrative review of the built environment discipline's role in the development of society's resilience to disasters. *International Journal of Disaster Resilience in the Built Environment*, 1, 11-24.
- Kot, F. C. & Hendel, D. D. 2012. Emergence and growth of professional doctorates in the United States, United Kingdom, Canada and Australia: a comparative analysis. *Studies in Higher Education*, 37, 345-364.
- Malalgoda, C., Keraminiyage, K., Amaratunga, D., Haigh, R., Perera, S. & Adeniyi, O. 2015. Professional doctorates: applicability to the construction industry in increasing societal resilience to disasters. In: MACKEE, J., GIGGINS, H. & GAJENDRAN, T. (eds.) *5th International Conference on Building Resilience*. Newcastle, Australia.
- Max Lock Centre 2009. The Built Environment Professions in Disaster Risk Reduction and Response - A guide for humanitarian agencies. Westminster, UK.
- Miau, J., Wu, J., Chiu, H. & Chung, K. 2001. Promoting university- industry and international collaborations in aerospace engineering education in Taiwan. *International Conference in Engineering Education*. Oslo, Norway.
- OECD. 2004. Lifelong learning. *OECD Policy Brief* [Online]. Available: <http://www.oecd.org/dataoecd/17/11/29478789.pdf> [Accessed 15 April 2015].
- Ofori, G. 2004. Construction industry development for disaster prevention and response.

- Available: http://www.grif.umontreal.ca/pages/i-rec_papers/ofori.pdf [Accessed 27 February 2009].
- Ozansoy, C. R., Navaratnam, V., Venkatesan, S., Sarma, V., Keating, S. & Du, X. 2009. University-Industry Collaboration in Learning in the Workplace and Community Project Work *Proceedings of the 2nd International Research Symposium on PBL*.
- Shaw, R., Takeuchi, Y. & Rouhban, B. 2009. Education, Capacity Building and Public Awareness for Disaster Reduction. In: SASSA, K. & CANUTI, P. (eds.) *Landslides – Disaster Risk Reduction*. Springer Berlin Heidelberg.
- Siriwardena, M., Malalgoda, C., Thayaparan, M., Amaratunga, D. & Keraminiyage, K. 2013. Disaster resilient built environment: role of lifelong learning and the implications for higher education. *International Journal of Strategic Property Management*, 17, 174-187.
- Strier, R. 2011. The construction of university-community partnerships: entangled perspectives. *Higher Education*, 62, 81-97.
- Thayaparan, M., Siriwardena, M., Malalgoda, C. I., Amaratunga, D., Lill, I. & Kaklauskas, A. 2015. Enhancing post-disaster reconstruction capacity through lifelong learning in higher education. *Disaster Prevention and Management: An International Journal*, 24, 338-354.
- UKCGE 2002. Professional Doctorates UKCGE. Dudley, UK.
- UNISDR 2015. Sendai Framework for Disaster Risk Reduction 2015 - 2030. Geneva, Switzerland: UNISDR.
- Williams, A. 2005. Guest Editorial - Industry Engagement in the Built Environment *CEBE Transactions*, 2, 1-5.
- Witt, E., Bach, C., Lill, I., Palliyaguru, R., Perdikou, S. & Özmen, F. 2014. Determining Demand for Disaster Resilience Education through Capacity Analysis of European Public Authorities. *CIB INTERNATIONAL CONFERENCE 2014: W55/65/89/92/96/102/117 & TG72/74/81/83 Construction in a Changing World*. Kandalama, Sri Lanka.